KEY TO THE FAMILIES OF NORTH AMERICAN INSECTS

AN INTRODUCTION TO THE CLASSIFICATION OF INSECTS

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TO OUR FORMER TEACHERS,
HERBERT EUGENE WALTER,
OLIVER S. WESTCOTT, AND
WILLIAM MORTON WHEELER,
THIS BOOK IS DEDICATED.

PREFACE.

The present manual attempts to bring together a brief yet complete key to the families of American insects, unhampered by more than the explanations needed to make such a tabulation available to the general student. It has been prepared to meet the requirements, not alone of college courses in systematic entomology, but also of agricultural high schools and of physicians, fruit inspectors, the modern farmer, the nature-lover, or any one who is concerned with the practical identification of insects.

More than fifty thousand different species of insects are now known from North America. Their descriptions fill libraries and their final identification requires the knowledge of specialists. Obviously no single volume can provide for their determination. But this host of species is divided into groups of related forms, the families of insects, and it is with their recognition that the present work deals.

Identification of the families has been effected by means of analytical keys, which have been arranged as dichotomies. In the first couplet, for example, two contrasting descriptions are given, one of which should agree with the insect to be determined. The number at the end of this description indicates the couplet which should then be studied, and so on until the final name is secured. All of the keys have been arranged in this way, as the writers' experience in the classroom shows that specimens can be most easily and rapidly classified with a key of this type, which also requires much less space for printing. While the dichotomies frequently represent the natural relationships or the lines of phyletic development, no attempt has been made to preserve natural divisions wherever the convenience and practical operation of the keys would have been sacrificed.

As the tabulation is designed mainly for identification, characters not readily seen on the usual pinned laboratory specimens have been minimized. The nomenclature of the body-parts and of the wings has been adapted from that used in the bulk of the systematic literature upon the separate orders. Such terms unfortunately do not always agree with undoubted homologies of these parts but are those which are encountered in the literature to which reference must be made for more extended taxonomic

work. A special glossary and drawings of anatomical details will familiarize the student with unusual terms. The keys are intended only for adult insects as there is as yet no complete guide to the younger stages, although a few hints are given in the key to orders to indicate the position of immature forms.

For a bibliography of the more important papers dealing with the further classification of North American insects, the student is referred to Banks, Bulletin No. 81, Bureau of Entomology, U. S. Department of Agriculture (1910).

Preceding each family name are cited several representative genera, and, in the case of a number of economically important species, the common and specific names are also given, inclosed in brackets after the generic name. Thus the genera are in heavy-face type, the Latin specific names in italics, and the common names in Roman. A few synonyms have been inserted, in italics, both for genera and for families, to associate the names here used with others commonly occurring in publications. The family names have been formed in accordance with the rule of the zoölogical code requiring the suffix-*idæ* after the root of the oldest genus name, although this has resulted in a number of minor changes in orthography. The pronunciation of the Latin names is indicated by an accent mark, placed over the vowel in the accented syllable, a long vowel indicated by a grave accent (*e.g.* è) and a short one by an acute accent (*e.g.* é).

The Linnean classification of insects into seven orders has been long abandoned as an artificial grouping of unrelated forms. We have followed the unified ordinal groups essentially as limited by Handlirsch.[1]

The families of a few of the orders recently monographed have been adopted almost without change. Thus the Dermaptera are based on Burr,[2] the Hemiptera on Reuter,[3] the Lepidoptera to a great extent on Forbes,[4] the Mallophaga on Kellogg,[5] the Strepsiptera on Pierce,[6] and the Trichoptera on Ulmer.[7]

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[1] *Die fossilen Insekten und die Phylogenie der rezenten Formen. Leipzig,* 1908. Wilhelm Englemann.

[2] Wytsman's Genera Insectorum, fasc. 122 (1913).

[3] Oefv. Fin. Vet. Förh., liv, (1911–12).

[4] Psyche, xxi, 53–65 (1914).

[5] Wytsman's Genera Insectorum, fasc. 66 (1908).

[6] Bull. U. S. Nat. Mus., No. 66 (1909).

[7] Wytsman's Genera Insectorum, fasc. 60 (1907).

The families of the Coleoptera are mainly those recognized by Sharp and Ganglbaur, and largely reverse the familiar sequence given by Le Conte and Horn. Two or three orders do not occur in North America, but have been added to the key for the sake of completeness. A few families absent in North America have representatives in Central America or the West Indies, and these also have been included.

The present system of insect classification has gradually been evolved by many workers in almost innumerable contributions published during the course of more than a century. During this time systems have been proposed, wholly or partially discarded, or incorporated into new ones. The task of the writers has been little more than to compile from this existing literature the most recent ideas, and they have gleaned from so many sources in various languages that it is impossible to refer to all in detail. To some extent this is also true of the illustrations which have been very largely redrawn from published figures, by Beirne Barrett Brues, the wife of one of the authors. The original source of the drawings is indicated on the explanations to the plates by the name of the author in parentheses, although it must be stated that many have been simplified, differently lettered, or otherwise modified to adapt them to the purpose of the present manual.

While family groupings should be of equal rank throughout the animal kingdom, they are not always coördinate, since they are concepts rather than concrete divisions and hence are subject to the variability of ideas. That the specialist is apt to narrow his limitations can be seen by the constantly increasing number of families proposed. For example, the old group Tachinidæ, geologically one of the most recent of insects, has been segregated into scores of so-called families. If this course is accepted in one group it carries with it a tacit elevation of all other ranking minor groupings and thus the family concept becomes altered. Since views on classification irresistibly shift through such changes and are constantly diverted by the discovery of annectant forms, no taxonomic scheme can be considered complete or final. While the writers have to some extent attempted to keep the family groupings balanced, yet they fully appreciate the futility of such an endeavor and present the following outline as seemingly that most widely accepted by present-day entomologists.

CONSPECTUS OF THE HIGHER GROUPS OF INSECTS.

Class PTERYGOGENEA

Subclass Orthopteroidea

Order **GRYLLOBLATTOIDEA** (Grylloblattidæ)
Order **ORTHOPTERA**
  Suborder **Acridoidea** (Acridiidæ, Tettigidæ)
  Suborder **Locustoidea** (Locustidæ, Gryllidæ, Gryllotalpidæ, Tridactylidæ)
Order **PHASMOIDEA** (Phasmidæ)
Order **DIPLOGLOSSATA** (Hemimeridæ)
Order **DERMAPTERA** (Pygidicranidæ, Labiduridæ, Labiidæ, Forficulidæ)
Order **THYSANOPTERA**
  Suborder **Terebrantia** (Æolothripidæ, Thripidæ)
  Suborder **Tubulifera** (Phlœothripidæ)

Subclass Blattæformia

Order **MANTOIDEA** (Mantidæ)
Order **BLATTOIDEA** (Blattidæ)
Order **ZORAPTERA** (Zorotypidæ)
Order **ISOPTERA** (Protermitidæ, Termitidæ)
Order **CORRODENTIA** (Psocidæ, Atropidæ)
Order **MALLOPHAGA**
  Suborder **Ischnocera** (Trichodectidæ, Philopteridæ)
  Suborder **Amblycera** (Gyropodidæ, Liotheidæ)
Order **SIPHUNCULATA** (Pediculidæ, Hæmatopinidæ, Echinophthiriidæ)

Subclass Hymenopteroidea

Order **HYMENOPTERA**
  Suborder **Chalastogastra** (Xyelidæ, Pamphiliidæ, Oryssidæ, Cephidæ, Xiphydriidæ, Siricidæ, Cimbicidæ, Hylotomidæ, Diprionidæ, Tenthredinidæ, Pterygophoridæ)
  Suborder **Clistogastra**
    ICHNEUMONIFORMIA:
      ICHNEUMONOIDEA (Evaniidæ, Roproniidæ, Stephanidæ, Alysiidæ, Ichneumonidæ, Capitoniidæ, Braconidæ, Myersiidæ)
      CYNIPOIDEA (Figitidæ, Ibaliidæ, Cynipidæ)
      CHALCIDOIDEA (*Mymaridæ*, *Agaonidæ*, Eucharidæ, Perilampidæ, Callimomidæ, Leucospidæ, Chalcididæ, Eurytomidæ, Cleonymidæ, Miscogastridæ, Pteromalidæ, Eulophidæ, Elasmidæ, Trichogrammatidæ)
    VESPIFORMIA (Trigonaloidæ, Heloridæ, Diapriidæ, Platygastridæ, Scelionidæ, Ceraphronidæ, Formicidæ, Vanhorniidæ, Chrysididæ,

Bethylidæ, Embolemidæ, *Dryinidæ*, Serphidæ, Pelecinidæ, Vespidæ, Eumenidæ, Psammocharidæ, Masaridæ, Sapygidae, Myzinidæ, Tiphiidæ, Scoliidæ, Rhopalosomatidæ, Myrmosidæ, Cosilidæ, Mutillidæ

SPHECIFORMIA (Crabronidæ, Oxybelidæ, Trypoxylonidæ, Philanthidæ, *Bembecidæ*, Nitelidæ, Larridæ, Psenidæ, *Mellinidæ*, Ampulicidæ, Sphecidæ, Stizidæ, Nyssonidæ, Alysonidæ, Gorytidæ)

ANTHOPHILA (Apidæ, *Bombidæ*, Prosopidæ, Colletidæ, Andrenidæ, Panurgidæ, Anthophoridæ, *Nomadidæ*, Meleetidæ, Megachilidæ, Xylocopidæ, Ceratinidæ)

Subclass **Coleopteroidea**

Order **COLEOPTERA**

Suborder **Adephaga** (Cicindelidæ, Carabidæ, Haliplidæ, Amphizoidæ, Dytiscidæ, Gyrinidæ, Rhysodidæ, Cupedidæ)

Suborder **Polyphaga**

PALPICORNIA (Hydrophilidæ)

STAPHYLINIFORMIA (*Silphidæ*, Scydmænidæ, Leptinidæ, Clambidæ, *Aphenocephalidæ*, *Orthoperidæ*, Ptiliidæ, Sphæriidæ, Hydroscaphidæ, *Scaphidiidæ*, *Platypsyllidæ*, *Staphylinidæ*, Pselaphidæ, Histeridæ)

MALACODERMATA (Lampyridæ, Lycidæ, Telephoridæ, Malachiidæ, *Cleridæ*, Corynetidæ, Derodontidæ)

CUCUJOIDEA (*Cucujidæ*)

CLAVICORNIA (Synteliidæ, Ostomatidæ, Nitidulidæ, Erotylidæ, Cryptophagidæ, *Phalacridæ*, *Lathridiidæ*, Mycetophagidæ, Adimeridæ, Colydiidæ, Cioidæ, Sphindidæ, *Endomychidæ*, Coccinellidæ)

BRACHYMERA (Byturidæ, Dermestidæ, Nosodendridæ, Byrrhidæ)

MACRODACTYLIA (Georyssidæ, Heteroceridæ, Helodidæ, *Eucinetidæ*, *Dryopidæ*)

SERRICORNIA (*Chelonariidæ*, Dascillidæ, Rhipiceridæ)

STERNOXIA (Cebrionidæ, *Elateridæ*, Eucnemidæ, Throscidæ)

BUPRESTOIDEA (Buprestidæ)

TEREDILIA (Lymexylonidæ, Micromalthidæ, *Bostrichidæ*, Lyctidæ, Ptinidæ, Anobiidæ)

HETEROMERA (Œdomeridæ, Cephaloönidæ, Pythidæ, Pyrochroidæ, *Hylophilidæ*, *Pedilidæ*, Anthicidæ, Melandryidæ, Scraptidæ, Monommidæ, Othniidæ, *Ægialitidæ*, Lagriidæ, Cistelidæ, Tenebrionidæ, Meloidæ, *Mordellidæ*, *Rhipiphoridæ*)

PHYTOPHAGA (Cerambycidæ, *Chrysomelidæ*, Bruchidæ)

RHYNCHOPHORA (Platypodidæ, Ipidæ, *Curculionidæ*, Anthribidæ, *Brenthidæ*)

LAMELLICORNIA (Lucanidæ, Sinodendridæ, Passalidæ, Trogidæ, Scarabæidæ)

Order **STREPSIPTERA** (Mengeidæ, *Xenidæ*, Halictophagidæ, Elenchidæ)

Subclass Embidaria

Order EMBIIDINA (Olynthidæ, Oligotomidæ, Embiidæ)

Subclass Libelluloidea

Order ODONATA
Suborder Zygoptera (Calopterygidæ, Agrionidæ)
Suborder Anisoptera (Æschnidæ, Libellulidæ)

Subclass Ephemeroidea

Order PLECTOPTERA (Ephemeridæ)

Subclass Perloidea

Order PLECOPTERA (Perlidæ)

Subclass Neuropteroidea

Order MEGALOPTERA (Sialididæ, Corydalidæ)
Order RAPHIDIOIDEA (Raphidiidæ)
3 Order NEUROPTERA (Mantispidæ, Ascalaphidæ, Myrmeleonidæ, Chrysopidæ, Dilaridæ, Polystœchotidæ, Berothidæ, Sysyridæ, Hemerobiidæ, Coniopterygidæ)

Subclass Panorpoidea

Order PANORPATÆ (Panorpidæ, Bittacusidæ, Meropidæ, Boreidæ)
Order TRICHOPTERA (Hydroptilidæ, Philopotamidæ, Limnephilidæ, Rhyacophilidæ, Phryganeidæ, Polycentropidæ, Hydropsychidæ, Psychomyiidæ, Calamocerotidæ, Sericostomatidæ, Molannidæ, Leptoceridæ, Odontoceridæ)
Order LEPIDOPTERA
Suborder Jugatæ (Hepialidæ, Micropterygidæ)
Suborder Frenatæ
TINEOIDEA: (Adelidæ, Gracilariidæ, Lyonetiidæ, Tischeriidæ, Acrolepiidæ, Prodoxidæ, Opostegidæ, Nepticulidæ, Tineidæ, Heliozelidæ, Heliodinidæ, Cosmopterygidæ, Elachistidæ, Blastobasidæ, Ethmiidæ, Œcophoridæ, Stenomidæ, Gelechiidæ, Yponomeutidæ, Tortricidæ, Pterophoridæ, Orneodidæ, Pyralididæ, Ægeriidæ, Castniidæ, Cossidæ, Thyrididæ, Chalcosiidæ, Pyromorphidæ, Dalceridæ, Megalopygidæ, Eucleidæ, Psychidæ, Lacosomatidæ, Nolidæ)
BOMBYCOIDEA: (Uraniidæ, Epiplemidæ, Geometridæ, Drepanidæ, Bombycidæ, Lasiocampidæ, Liparidæ, Thyatiridæ, Eupterotidæ, Notodontidæ, Dioptidæ, Pericopidæ, Noctuidæ, Agaristidæ, Arctiidæ, Lithosiidæ, Hypsidæ, Syntomidæ)
SATURNOIDEA: (Saturniidæ, Ceratocampidæ)
SPHINGOIDEA: (Sphingidæ)
PAPILIONOIDEA: (Hesperiidæ, Lycænidæ, Erycinidæ, Libytheidæ, *Lymnadidæ, Ithomiidæ, Heliconiidæ, Brassolidæ, Agapetidæ, Morphoidæ*, Nymphalidæ, Pieridæ, Papilionidæ, Parnassiidæ.)

Order **DIPTERA**

Suborder **Orthorrhapha**

NEMATOCERA

TIPULOIDEA: (Dixidæ, Tipulidæ, Limnobiidæ, Ptychopteridæ, Psychodidæ, Culicidæ, Chironomidæ, Sciaridæ, Cecidomyiidæ, Scatopsidæ, Mycetophilidæ.

BIBIONOIDEA: (Rhyphidæ, Orphnephilidæ, Blepharoceridæ, Bibionidæ, Simuliidæ)

BRACHYCERA

EREMOCHÆTA: (Stratiomyiidæ, Pantophthalmidæ, Xylophagidæ, Cœnomyiidæ, Tabanidæ, Rhagionidæ)

TROMOPTERA: (Cyrtidæ, Nemestrinidæ, Apioceridæ, Therevidæ, Bombyliidæ, Scenopinidæ)

DERMATINA: (Mydaidæ)

ENERGOPODA: (Asilidæ)

ORTHOGENYA: (Empididæ, Dolichopodidæ)

ACROPTERA: (Lonchopteridæ)

HYPOCERA: (Phoridæ)

Suborder **Cyclorrhapha**

ASCHIZA: (Platypezidæ, Pipunculidæ, Syrphidæ, **Conopidæ,)**

SCHIZOPHORA:

MYODARIA

SCHIZOMETOPA: (Gastrophilidæ, Œstridæ, Phasiidæ, Megaprosopidæ, Calliphoridæ, Sarcophagidæ, Rhinophoridæ, Dexiidæ Tachinidæ, Muscidæ, Anthomyiidæ)

HOLOMETOPA: (Helomyzidæ, Scatophagidæ, Heteroneuridæ, Phycodromidæ, Borboridæ, Sepsidæ, Tanypezidæ, Micropezidæ, Rhopalomeridæ, Dryomyzidæ, Tetanoceridæ, Lauxaniidæ, Ortalididæ, Lonchæidæ, Trypetidæ, Ephydridæ, Milichiidæ, Drosophilidæ, Chloropidæ, Geomyzidæ, Piophilidæ, Agromyzidæ, Ochthiphilidæ, Psilidæ, Diopsidæ)

PUPIPARA: (Nycteribiidæ, Streblidæ, Hippoboseidæ)

Order **SUCTORIA** (Pulicidæ, Ctenopsyllidæ, Hystrichopsyllidæ, Ceratopsyllidæ, Rhynchoprionidæ)

Subclass Rhynchota

Order **HOMOPTERA**

Suborder **Auchenorrhyncha** (Cicadidæ, Membracidæ, Cercopidæ, Bythoscopidæ, Proconiidæ, Jassidæ, Typhlocybidæ, Fulgoridæ, Cixiidæ, Achilidæ, Derbidæ, Issidæ, Flatidæ, Delphacidæ)

Suborder **Psylloidea** (Psyllidæ)

Suborder **Aleurodoidea** (Aleurodidæ)

Suborder **Aphidoidea** (Aphididæ)

Suborder **Coccoidea** (Coccidæ)

Order **HEMIPTERA** (Ochteridæ, Nerthridæ, Naucoridæ, Belostomatidæ, Nepidæ, Notonectidæ, Corixidæ, Dipsocoridæ, Schizopteridæ, Cimicidæ, Miridæ, Isometopidæ, Anthocoridæ, Gerridæ, Veliidæ, Hydrometridæ,

Polyctenidæ, Aradidæ, Dysodiidæ, Nabidæ, Henicocephalidæ, Mesoveliidæ, Acanthiidæ, Macrocephalidæ, Reduviidæ, Emesidæ, Hebridæ, Pyrrhocoridæ, Tingitidæ, Corizidæ, Coreidæ, Alydidæ, Piesmidæ, Myodochidæ, Neididæ, Pentatomidæ, Thyreocoridæ, Scutelleridæ.

Class THYSANURA

Order **LEPISMATOIDEA** (Lepismatidæ)
Order **MACHILOIDEA** (Machilidæ)

Class CAMPODEOIDEA

Order **RHABDURA** (Projapygidæ, Campodeidæ)
Order **DICELLURA** (Japygidæ)

Class COLLEMBOLA

Order **ARTHROPLEONA** (Aphoruridæ, Entomobryidæ, Poduridæ)
Order **SYMPHYPLEONA** (Sminthuridæ, Papiriidæ, Neëlidæ)

Class MIRIENTOMATA

Order **PROTURA** (Eosentomidæ)

KEY TO THE ORDERS OF INSECTS.

1. Wings developed 2
   Wingless, or with vestigial wings 29
2. The wings of the mesothorax (the fore wings) horny, leathery or parchment-like; prothorax large and separate from the mesothorax (except in the rare Strepsiptera, which have *minute fore wings*) 3
   The mesothoracic wings membranous 11
3. Mesothoracic wings (called tegmina or hemelytra) containing veins, or at least the metathoracic wings not folded crossways when hidden under the upper wings 4
   Mesothoracic wings (called elytra) veinless, of uniform consistency, the metathoracic wings, when present, folded crossways as well as lengthwise when at rest and hidden beneath the elytra; mouth mandibulate 10
4. Mesothoracic wings of uniform texture, usually with many veins; head vertical 5
   Mesothoracic wings leathery at the base, membranous at the tip, usually overlapping the abdomen when at rest; head usually horizontal; mouth beak-like or awl-shaped, fitted for sucking. True Bugs . . **HEMÍPTERA** (Page 76)
5. Mouth with the mandibles fitted for chewing 6
   Mouth fitted for sucking, the beak arising from the back part of the head and projecting backward . . . . **HOMÓPTERA** (Page 73)
6. Hind wings not folded, similar to the fore wings; social species, living in colonies. Termites . . . . **ISÓPTERA** (Page 17)
   Hind wings folding, broader than the fore wings 7
7. Usually rather large or moderately large species; antennæ lengthened and thread-like; prothorax large and free from the mesothorax; cerci present; fore wings rarely minute, usually long 8
   Very small active species; antennæ short, with few joints; no cerci; fore wings minute; prothorax small. Rare, short-lived insects, parasites of other insects, usually wasps and bees. Males of **STREPSÍPTERA** (Page 41)
8. Hind femora not larger than the fore femora; mute species; body more or less flattened with the wings superposed when at rest; tergites and sternites subequal 9
   Hind femora almost always much larger than the fore femora, jumping species, if not (Gryllotalpa) the front legs broadened for burrowing; species capable of chirping or making a creaking noise; body more or less cylindrical, the wings held sloping against the sides of the body when at rest; tergites usually larger than the sternites. Grasshoppers, Katydids, Crickets **ORTHÓPTERA** (Page 13)
9. Body elongate; head transverse, vertical, free, not set into the very long prothorax; front legs spined, formed for grasping prey; deliberate movers. Mantis . . . . **MANTOÍDEA** (Page 16)
   Body oval, much flattened; head nearly concealed underneath the oval pronotum; legs similar and fitted for rapid running, the coxæ large. Roaches **BLATTOÍDEA** (Page 16)

10. Abdomen terminated by movable forceps; antennæ long and slender; fore wings short, hind wings nearly circular, delicate, radially folded from near the center; elongate insects. Earwigs .... DERMÁPTERA (Page 15)
    Abdomen not terminated by forceps; antennæ of various forms but usually eleven-jointed; fore wings usually sheathing the abdomen; generally hard-bodied species. Beetles .... COLEÓPTERA (Page 30)

11. With four wings 12
    With but two wings (the mesothoracic) usually outspread when at rest..... 27

12. Wings long, very narrow, the margins fringed with long hairs, almost veinless; tarsi one- or two-jointed, with swollen tip; mouth without biting mandibles, fitted for sucking; no cerci; minute species. Thrips
    THYSANÓPTERA (Page 15)
    Wings broader and most often supplied with veins, if rarely somewhat linear the tarsi have more than two joints and the last tarsal joint is not swollen, 13

13. Hind wings with the anal area folded in plaits, fan-like, in repose, larger than the fore wings; antennæ prominent; veins usually numerous; larvæ aquatic, 14
    Hind wings not folded, not larger than the fore wings, the anal area small and not separated 16

14. Tarsi five-jointed; cerci not pronounced 15
    Tarsi three-jointed; body rather flattened, with jointed cerci; wings at rest overlapping the abdomen; species of moderate to large size. Stone-flies
    PLECÓPTERA (Page 44)

15. Costal area with few crossveins; wings with the surface hairy; prothorax small; species of small to moderate size. Caddice-flies
    TRICHÓPTERA (Page 46)
    Costal area with many crossveins; prothorax rather large; species of moderate to large size .... MEGALÓPTERA (Page 44)

16. Antennæ short and inconspicuous; wings netveined with numerous crossveins; larvæ aquatic. (SUBULICÔRNIA) 17
    Antennæ larger, distinct, if rarely small the crossveins are few; larvæ terrestrial 18

17. Hind wings much smaller than the fore wings; abdomen ending in long, thread-like processes; sluggish fliers. May-flies..... PLECTÓPTERA (Page 43)
    Hind wings nearly like the fore wings; no caudal setæ; vigorous, active fliers, often of large size. Dragon-flies, Damsel-flies..... ODONÀTA (Page 43)

18. Head produced into a mandibulate beak; hind wings not folded; wings usually with color pattern, the crossveins numerous; male genitalia forming a swollen pincers-like termination of the abdomen. Scorpion-flies
    PANORPÀTÆ (Page 46)
    Head not drawn out as a beak; male abdomen not forcipate 19

19. Mouth mandibulate 20
    Mouth haustellate, the mandibles not formed for chewing; no cerci; crossveins few 25

20. Tarsi five-jointed; no cerci 21
    Tarsi two-, three- or four-jointed; veins and crossveins not numerous 23

21. Prothorax small or only moderately long 22
Prothorax very long and cylindrical; antennæ many-jointed; crossveins numerous .... RAPHIDIOÍDEA (Page 44)
22. Wings similar, with many veins and crossveins, costal cell almost always filled with crossveins; prothorax more or less free. If the neuration is very rarely reduced (Coniopteryx) the wings are powdered. . NEURÓPTERA (Page 45)
Wings with relatively few angular cells, the costal cell without crossveins; hind wings smaller than the fore pair; prothorax fused with the mesothorax; abdomen usually constricted at the base and ending in a sting or specialized ovipositor. Wasps, Bees, etc .... HYMENÓPTERA (Page 19)
23. Prothorax well developed; wings equal in size, held superimposed on the abdomen when at rest 24
Prothorax inconspicuous; hind wings smaller than the fore wings; tarsi two- or three-jointed; wings at rest held roof-like against the abdomen CORRODÉNTIA (Page 17)
24. Tarsi apparently four-jointed; social species, living in colonies ISÓPTERA (Page 17)
Tarsi three-jointed, the front metatarsi swollen; solitary; southern species EMBIIDÌNA (Page 42)
25. Wings not covered with scales, usually transparent, not outspread when at rest; prothorax large; antennæ with few joints 26
Wings and body covered with scales, the wings well developed and pictured; prothorax small; antennæ many-jointed. Moths and Butterflies LEPIDÓPTERA (Page 48)
26. Beak arising from the back of the head .... HOMÓPTERA (Page 73)
Beak arising from the front part of the head ...... HEMÍPTERA (Page 76)
27. Mouth not functional; abdomen furnished with a pair of caudal filaments . . 28
Mouth-parts forming a proboscis, only exceptionally vestigial; abdomen without caudal filaments; hind wings replaced by knobbed halteres. Flies, Mosquitoes, Midges .... DÍPTERA (Page 61)
28. No halteres; antennæ inconspicuous; crossveins abundant. A few rare May-flies .... PLECTÓPTERA (Page 43)
Hind wings represented by minute hook-like halteres; antennæ evident; crossveins lacking. Males of Scale-insects .... HOMÓPTERA (Page 73)
29. Body more or less insect-like, *i. e.* with more or less distinct head, thorax and abdomen, and jointed legs, and capable of locomotion 30
Without distinct body parts, or without jointed legs, or incapable of locomotion 70
30. Terrestrial, breathing through spiracles 31
Living in the water; usually gill-breathing, larval forms 59
Parasites on warm-blooded animals 65
31. Mouthparts vestigial, retracted in the head and scarcely or not at all visible; underside of the abdomen with styles or other appendages; very delicate small or minute insects 32
Mouthparts mandibulate, formed for chewing 38
Mouthparts haustellate, formed for sucking 55

32. Abdomen consisting of ten or eleven segments, no ventral sucker at its base, no terminal springing apparatus 33
Abdomen consisting of six segments or less, with a forked sucker on the first ventral segment and usually with a springing apparatus (furcula) near the tip beneath. (Class COLLÉMBOLA) 37

33. Basal three segments of the abdomen with ventral styles; antennæ absent; no cerci but a short anal tube present; head pear-shaped; prothorax short. (Class MIRIENTÓMATA) . . . . . **PROTÙRA** (Page 83)
Ventral styles occurring to the seventh segment; antennæ thread-like; cerci present; prothorax not short 34

34. Body never scaly; mouthparts concealed except for the palpi; apex of the abdomen without a median process. (Class CAMPODEOÍDEA) 35
Body usually covered with minute scales; tips of the mouthparts visible; abdomen with a median cerciform appendage. (Class THYSANÙRA) 36

35. Eleventh tergite nearly or quite covered by the tenth; cerci jointed; anal valves very distinct . . . . . **RHABDÙRA** (Page 82)
Eleventh tergite fused with the tenth; cerci single-jointed forming strong forceps; anal valves not distinct . . . . . **DICELLÙRA** (Page 82)

36. Body flattened; eyes not extending over the front; maxillary palpi five- or six-jointed; eleventh tergite partly covered by the tenth
LEPISMATOÍDEA (Page 81)
Body convex above; eyes large, extending over the front; maxillary palpi seven-jointed; eleventh tergite not covered by the tenth
MACHILOÍDEA (Page 81)

37. Abdomen comprising six evident segments; body lengthened, subcylindrical; fourth segment of the abdomen often much lengthened
ARTHROPLEÒNA (Page 82)
Abdominal segments in part fused; body subglobular, the abdomen little longer than wide . . . . . **SYMPHYPLEÒNA** (Page 83)

38. Underside of abdomen entirely without legs 39
Abdomen bearing false legs beneath which differ from those of the thorax; body cylindrical, the thorax and abdomen not distinctly separated; larval forms . 54

39. Antennæ long and distinct 40
Antennæ short, not pronounced; larval forms 52

40. Abdomen terminated by strong movable forceps; prothorax free. Earwigs
DERMÁPTERA (Page 15)
Abdomen not ending in forceps 41

41. Abdomen not strongly constricted at the base, broadly joined to the thorax, 42
Abdomen strongly constricted at the base; prothorax fused with the mesothorax. Ants, etc . . . . . **HYMENÓPTERA** (Page 19)

42. Head not prolonged into a beak 43
Head produced into a mandibulate beak; species found about snow. (Boreus)
PANORPÀTÆ (Page 46)

43. Very small (three millimeters) louse-like jumping species; prothorax inconspicuous. Book-lice.......................CORRODÉNTIA (Page 17)
Larger, or at least not louse-like species; prothorax large..................44

44. Hind legs fitted for jumping, the femora enlarged; wing-pads of larvæ when present in inverse position, the metathoracic overlapping the mesothoracic ORTHÓPTERA (Page 13)
Hind legs not enlarged for jumping; wing-pads, if present, in normal position..45

45. Prothorax much longer than the mesothorax; front legs fitted for grasping prey....................................MANTOÍDEA (Page 16)
Prothorax not greatly lengthened..................................46

46. Cerci present; antennæ usually with more than fifteen joints, often many-jointed..47
No cerci; body often hard-shelled; antennæ usually with eleven joints COLEÓPTERA (Page 30)

47. Cerci with more than three joints....................................48
Cerci short, with one to three joints....................................49

48. Body flattened and oval; head inflexed; prothorax oval. Roaches. BLATTOÍDEA (Page 16)
Body elongate; head nearly horizontal; prothorax quadrate. GRYLLOBLATTOÍDEA (Page 13)

49. Tarsi five-jointed; body very slender and long. Walking-sticks PHASMOÍDEA (Page 14)
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50. Front tarsi not enlarged..51
Front tarsi with the first joint swollen...........EMBIIDÌNA (Page 42)

51. Tarsi apparently four-jointed; cerci with several joints; antennæ with nine to thirty joints.................................ISÓPTERA (Page 17)
Tarsi two-jointed; cerci one-jointed; antennæ nine-jointed; minute species restricted to the East Indies..................ZORÁPTERA (Page 17)

52. Body cylindrical, caterpillar-like................PANORPÀTAE (Page 46)
Body more or less depressed, not caterpillar-like.........................53

53. Mandibles united with the corresponding maxillæ to form sucking jaws Larvæ of Neuróptera
Mandibles almost always separate from the maxillæ Larvæ of Coleóptera, Raphidioídea, Strepsíptera

54. False legs numbering five pairs or less...............Larvæ of Lepidóptera
False legs numbering six to eight pairs Most larvæ of suborder Chalastogástra, Hymenóptera

55. Body bare or with few scattered hairs....................................56
Body densely clothed with hairs or scales; proboscis if present coiled under the head. Moths...........................LEPIDÓPTERA (Page 48)

56. Last tarsal joint swollen and with no claws; mouth consisting of a triangular unjointed beak; minute species. Thrips....THYSANÓPTERA (Page 15)
Tarsi not bladder-like at the tip, and with distinct claws..................57

57. Prothorax distinct 58
Prothorax small, hidden when viewed from above . . . . . . DÍPTERA (Page 61)

58. Beak arising from the front part of the head . . . . HEMÍPTERA (Page 76)
Beak arising from the back part of the head . . . . HOMÓPTERA (Page 73)

59. Mouth mandibulate 60
Mouth haustellate, forming a strong pointed inflexed beak
Nymphs of Hemíptera

60. Body not encased in a shell made of sand, pebbles, leaves, etc. 61
Case-bearing forms. Periwinkles . . . . Larvæ of Trichóptera

61. Abdomen furnished with external lateral gills or respiratory processes (a few Coleoptera here also) 62
Abdomen without external gills 63

62. Abdomen terminated by two or three long feathery gill-processes
Larvæ of Plectóptera
Abdomen with short end-processes . . . . Larvæ of Megalóptera

63. Lower lip strong, extensile, and furnished with a pair of opposable hooks
Larvæ of Odonàta
Lower lip not capable of being thrust forward and not hooked 64

64. The three divisions of the thorax loosely united; antennæ and caudal filaments long and slender . . . . Larvæ of Plecóptera
Thoracic divisions not constricted; antennæ and caudal filaments short
Larvæ of Coleóptera

65. Body flattened 66
Body strongly compressed; mouth formed as a sharp inflexed beak; jumping species. Fleas . . . . SUCTÒRIA (Page 72)

66. Mouthparts formed for biting (chewing) 67
Mouthparts formed for piercing and sucking 68

67. Mouth inferior; cerci long; African species parasitic on rodents
DIPLOGLOSSÀTA (Page 14)
Mouth anterior; no cerci; generally elongate-oval insects with somewhat triangular head; parasites of birds or mammals. Biting-lice
MALLÓPHAGA (Page 18)

68. Antennæ exserted, visible, though rather short 69
Antennæ inserted in pits, not visible from above
Pupiparous DÍPTERA (Page 61)

69. Beak unjointed; tarsi formed as a hook for grasping the hairs of the host; permanent parasites. Lice . . . . SIPHUNCULÀTA (Page 18)
Beak jointed; tarsi not hooked; temporary parasites
HEMÍPTERA (Page 76)

70. Legless, grubs, maggots or borers; locomotion effected by a squirming motion. Larvæ of some beetles, flies, moths, ants, bees and wasps. If living in the body of wasps or bees, with the head exposed, compare the females of Strepsíptera.
Sedentary forms, incapable of locomotion 71

71. Small degraded forms bearing little superficial resemblance to insects, with a long slender beak, and usually covered with a waxy scale or powder or cottony tufts; living on various plants. Scale insects
HOMÓPTERA (Page 73)

Body quiescent, but able to bend from side to side; not capable of feeding, enclosed in a skin which is tightly drawn over all the members, or which leaves the limbs free but folded against the body; sometimes free, sometimes enclosed in a cocoon or in a shell formed from the dried larval skin......72

72. The skin encasing the legs, wings, etc., holding the members tightly against the body; prothorax small; a proboscis showing........................73

Legs, wings, etc., more or less free from the body; biting mouthparts showing...74

73. Proboscis long; four wing-cases; sometimes in a cocoon..Pupæ of Lepidóptera

Proboscis short; two wing-cases.........................Pupæ of Díptera

74. Prothorax small, fused into one piece with the mesothorax; sometimes enclosed in a loose cocoon...............................Pupæ of Hymenóptera

Prothorax larger and not closely fused with the mesothorax...............75

75. Wing-cases with few or no veins.....................Pupæ of Coleóptera

Wing-cases with a number of veins............Pupæ of Neurópteroid Orders

ORDER GRYLLOBLATTOIDEA.

Elongate, flattened, wingless insects measuring over one inch in length. Head nearly horizontal, free, eyes small, no ocelli, antennæ long and thread-like, arising from the front of the head, mandibles strong; prothorax large, quadrate, free; legs formed for running, similar, coxæ close together, tarsi five-jointed; cerci long, filiform, eight-jointed, ovipositor long and sword-shaped.

(**Grylloblatta.**) (Pl. 2, fig. 19.) .... **GRYLLOBLATTIDÆ**

ORDER ORTHOPTERA.

(*ULONATA*, part; *SALTATORIA.*)

Small to large, jumping species usually possessing a device on the wings for making a creaking sound; hind femora almost always very much stouter basally, or longer, or both, than the middle femora; wings of adults reposing over the abdomen, the fore wings toughened, narrower and thicker than the membranous, plaited hind pair; sometimes the wings vestigial or completely absent; head usually vertical; ovipositor almost always free; mouthparts conspicuous, mandibulate; metamorphosis gradual, the young resembling the adults, but with the small wings in a reversed position in the last two nymphal stages, the hind wings then overlapping the fore wings.

1. Antennæ almost always shorter than the body, generally thread-like and never distinctly tapering, joints distinct, often flattened; ocelli three; tarsi three-jointed, alike on all the legs; ovipositor short; auditory organs, if present, at the base of the abdomen 2

   Antennæ generally longer than the body, filamentous, delicately tapering; ocelli often absent; ovipositor usually long; auditory organ usually near base of front tibiæ 3

2. Claws with a pad (arolium) beneath and between them; pronotum at most extending over only the extreme base of the abdomen (Pl. 1, fig. 7); fore wings generally well developed. Locusts, Grasshoppers. (**Melanòplus** [*M. sprètus*, Rocky Mountain locust], **Chortóphaga**, **Hippíscus**, **Dissosteìra** [*D. carolìna*, Carolina locust].) (Pl. 1, fig. 8) .... **ACRIDÌIDÆ**

   Claws without arolium; pronotum extending over the abdomen (Pl. 1, fig. 6); fore wings vestigial, consisting of small scales at the base of the usually large hind wings. Grouse-locusts, Pigmy locusts. (**Tèttix**) (Pl. 1, figs. 10, 11.) **TETTÍGIDÆ**

3. Tarsi four-jointed; ovipositor usually long and sword-shaped; ocelli generally absent; fore wings, when present, with the sides sloping. Katydids, Green or long-horned grasshoppers. (**Scuddêria, Conocéphalus, Ceuthóphilus** [Cave-cricket].) (Pl. 1, figs. 2, 3, 4.) (*TETTIGONIDÆ, PHASGONURIDÆ*) .... **LOCÚSTIDÆ**
   Tarsi three-jointed; ovipositor, when present, exserted and needle-shaped, sometimes upcurved or with the tip enlarged; fore wings, when present, flat above, and with the sides bent abruptly downward. (GRYLLÒDEA)...4
4. Front legs more or less broadened and fitted for burrowing; females without ovipositor 5
   Front legs slender, fitted for walking; female with needle-shaped ovipositor, which may sometimes be reduced in size. Crickets. (**Grýllus, Œcánthus** [Tree crickets], **Myrmecóphila.**) (Pl. 1, figs. 12, 13.) (*ACHÊTIDÆ*) **GRÝLLIDÆ**
5. Two large ocelli; front tibiæ dilated, their outer edge strongly toothed; hind femora scarcely enlarged; tarsi three-jointed; over 25 mm. in length. Mole crickets. (**Gryllotálpa.**) (Pl. 1, figs. 9, 14.) .... **GRYLLOTÁLPIDÆ**
   Three small ocelli; front tibiæ scarcely dilated, but with three or four strong spines at apex; hind femora greatly enlarged; tarsi one-jointed; less than 10 mm. in length. (**Tridáctylus.**) (Pl. 1, fig. 5.).... **TRIDACTÝLIDÆ**

ORDER PHASMOIDEA.

(*GRESSORIA.*)

Large, wingless, slow-moving, slender, plant-eating insects with long, thin legs. Body narrowly cylindrical, head rather horizontal, generally rounded, ocelli often absent; mouth rather anterior, mandibles strong, antennæ coarse, comprising more than twenty joints; prothorax very short, front legs similar to the others, coxæ small and distant, tarsi five-jointed; cerci present but unsegmented. Metamorphosis very slight. Walking-sticks.

Diapheromêra, Bacíllus.) (Pl. 1, fig. 1.) .... **PHÁSMIDÆ**

ORDER DIPLOGLOSSATA.

(*DERMODERMAPTERA.*)

Moderate sized, flattened, wingless species parasitic on rodents. Head movable, rather horizontal, mouth underneath, mandibles strong, no eyes, antennæ short; prothorax free, large; legs alike, tarsi three-jointed; cerci long, but unsegmented. Metamorphosis imperceptible.

One family **HEMIMÉRIDÆ**, restricted to South Africa.

ORDER DERMAPTERA.

(*EUPLEXOPTERA; EUDERMAPTERA.*)

Elongate, but small insects with the abdomen terminating in a pair of strong movable forceps. Fore wings horny, but short, hind wings large, nearly circular, radially folded from near the center (Pl. 1, fig. 18), when folded, projecting slightly beyond the upper pair; mouth mandibulate; antennæ long and slender. Metamorphosis incomplete. Earwigs.

1. Metapygidium and telson not reduced, nearly as large as the pygidium which is relatively small; head depressed, truncate or concave posteriorly; femora compressed and usually keeled; tropical earwigs. (**Pýragra, Pyragrópsis.**) (Pl. 1, fig. 15.) .... **PYGIDICRÁNIDÆ**

   Metapygidium and telson much reduced, very greatly smaller than the pygidium which is relatively very large and sometimes with complex processes...... 2

2. Metapygidium and telson although reduced in size, still present as distinct plates, if sometimes lost in the pygidium, the latter is fused with the last dorsal segment to form a horizontal squamopygidium; femora not compressed or keeled; head gently convex. (**Anisolàbis, Labidùra.**) (Pl. 1, fig. 17.) .... **LABIDÙRIDÆ**

   Metapygidium not distinct; pygidium well developed, often provided with complex processes 3

3. Second joint of tarsi simple, not lobed nor dilated. (**Làbia, Prolàbia.**) **LABÌIDÆ**

   Second joint of tarsi with a dilated lobe on each side. (**Forfícula, Dòru.**) (Pl. 1, fig. 16.) .... **FORFICÙLIDÆ**

ORDER THYSANOPTERA.

(*PHYSOPODA.*)

Small or minute, slender species with the wings often absent or reduced in size, feeding usually on plant sap. Head vertical, free; eyes well developed; usually three ocelli; mouthparts fitted for sucking, inferior, frequently asymetrical; prothorax free; wings, when present, very narrow, usually with long marginal fringes, the venation greatly reduced; legs similar, tarsi one- or two-jointed, with a bladder-like or hoof-like enlargement at tip; no cerci. Metamorphosis gradual, the young very similar to the adult.

1. Female with a saw-like ovipositor (Pl. 2, fig. 31); last segment of female abdomen conical, that of the male broadly rounded; wings usually present, the fore pair strongest, usually with more or less well developed veins and

always at least one longitudinal vein reaching from base to apex; wing membrane with microscopic hairs. (Suborder TEREBRÂNTIA).......2

Female without a modified ovipositor, the last segment of the abdomen tubular in both sexes; wings often absent, both pairs similar in structure, the fore wings with only a median longitudinal vein which does not reach to the tip of the wing; wing membrane without microscopic hairs. (Suborder TUBULÍFERA.) (**Phlœothrips, Trìchothrips, Crýptothrips.**) **PHLŒOTHRÍPIDÆ**

2. Ovipositor curved upwards; fore wings broad, rounded and with prominent veins; antennæ nine-jointed. (**Æòlothrips**)..........**ÆOLOTHRÍPIDÆ**

Ovipositor curved downwards; wings when present usually narrow and pointed at tips; antennæ seven- to ten-jointed. (**Thríps** [*T. tábaci*, Onion Thrips] **Eùthrips** [*E. pýri*, Pear Thrips; *E. trítici*, Strawberry Thrips], **Hèliothrips** [*H. hæmorrhoidàlis*, Greenhouse Thrips].) (Pl. 2, figs. 21, 31.) **THRÍPIDÆ**

ORDER MANTOIDEA.

Large, poor-flying, deliberate-moving, predatory species with long, spined front legs, which are formed for grasping prey. Body elongate; head freely movable, not inserted in the prothorax, eyes prominent; three ocelli; mouth inferior, mandibles strong, antennæ filament-like, comprising many similar joints; prothorax always lengthened and movable; wings dissimilar, overlapping on the abdomen; cerci jointed. Metamorphosis incomplete. Praying Mantis.

(**Stagmomântis.**) (Pl. 2, fig. 22.)..............................**MÂNTIDÆ**

ORDER BLATTOIDEA.

(*OÖTHECARIA, CURSORIA.*)

Moderate-sized, broadly oval, flattened, quick-running insects. Head free but inflexed so as to be nearly or quite concealed beneath the pronotum, the mouth posterior or nearly so, mandibles strong, usually two ocelli; antennæ long, filamentous, many-jointed; prothorax large, movable, usually transverse; wings when present overlapped on the abdomen; fore wings parchment-like, containing many veins, hind wings radially folding; legs strong, alike, coxæ large; cerci prominent and jointed. Metamorphosis slight. Roaches.

(**Phyllodròmia,** (=*Blattélla*) [*P. germánica,* Croton bug], **Periplanèta, Ischnóptera, Blátta.**) (Pl. 2, figs. 23, 25.)........................**BLÁTTIDÆ**

ORDER ZORAPTERA.

Minute, wingless, agile, terrestrial, predatory species. Body flattened, head somewhat inclined, antennæ moniliform, nine-jointed, mandibles strong, eyes vestigial; thorax as long as the abdomen, prothorax large; abdomen with ten segments, cerci one-jointed; legs similar, formed for running, tarsi two-jointed.

One family, **ZOROTÝPIDÆ**, restricted to the East Indies. (Pl. 2, fig. 26.)

ORDER ISOPTERA.

Small to middle-sized, elongate, feeble insects living in colonies and occurring as sexual individuals, soldiers and workers; usually with weak chitinization. Head large, free, rather vertical, eyes and ocelli present or absent, mandibles often large, antennæ filamentous; prothorax large, free; legs similar, formed for running, tarsi apparently four-jointed; wings similar, narrow and long, superimposed over the abdomen, soldiers and workers wingless; cerci short. Metamorphosis very imperfect. White ants, Termites.

Tarsi with an apical sole-like pad; eyes present, mandibles toothed; pronotum flat; wings reticulate; fontanel absent. (**Termópsis, Calotérmes.**) **PROTERMÍTIDÆ**

Plantula absent; mandibles not strongly toothed; pronotum convex; wings not strongly reticulate; vertex with fontanel. (**Térmes, Eutérmes.**) (Pl. 2, figs. 24, 27, 28.) (*METATERMÍTIDÆ*)........................**TERMÍTIDÆ**

ORDER CORRODENTIA.

(*PSOCOPTERA, COPEOGNATHA.*)

Small or minute, mandibulate insects with long slender antennæ, the body rather stout, the prothorax small, tarsi two-or three-jointed. Metamorphosis incomplete.

Wings well developed; ocelli present. Bark living insects. (**Cæcílius, Psòcus.**) (Pl. 2, fig. 29.)....................................**PSÓCIDÆ**

Wings absent, or at most a single small pair of mesothoracic wings present; ocelli absent. (**Tróctes,** [*T. divinatòria*, Book-louse], **Átropos, Psocinélla.**) (Pl. 2, fig. 30.)..**ATRÓPIDÆ**

ORDER MALLOPHAGA.

(*LIPOPTERA.*)

Small wingless insects averaging two mm. and very rarely over five mm. in length. Body oval, or elongate, very strongly flattened; usually strongly chitinized and generally with a conspicuous color pattern of pale or yellowish markings contrasting with spots or bands of dark brown or black. Mouth anterior, mandibles strong, antennæ three- to five-jointed; prothorax free; legs short, no cerci. Metamorphosis very incomplete. External parasites of birds, more rarely of mammals during entire life, feeding on feathers, fur or skin. (Bird Lice, Biting Lice.)

1. Antennæ filamentous, exposed, three- or five-jointed; maxillary palpi absent; mandibles vertical; meso- and metathoracic segments usually fused. Suborder *ISCHNÓCERA*....................................2

   Antennæ clavate or capitate, concealed, four-jointed; maxillary palpi four-jointed; mandibles horizontal; meso- and metathoracic segments with a sutural line usually visible. Suborder AMBLÝCERA..................3

2. Antennæ three-jointed; tarsi with a single claw; infesting mammals. (**Trichodéctes** [*T. làtus*, Dog Louse].)..........................**TRICHODÉCTIDÆ**

   Antennæ five-jointed; tarsi with two claws; infesting birds. (**Docóphorus, Nírmus, Lipeùrus.**) (Pl. 2, figs. 34, 35.)............**PHILOPTÉRIDÆ**

3. Tarsi with a single claw; infesting mammals. (**Gýropus.**)...**GYROPÓDIDÆ**

   Tarsi with two claws; infesting birds (except in a few cases). (**Ménopon, Trinòton.**)..**LIOTHÈIDÆ**

ORDER SIPHUNCULATA.

(*ANOPLURA, PSEUDORHYNCHOTA, PARASITA, PHTHIRAPTERA, ELLIPOPTERA.*)

Small, more or less flattened, wingless parasites of mammals. Head free, horizontal; eyes reduced or absent; mouth anterior, comprising an unjointed, fleshy beak; antennæ short; thorax fused; legs similar; tarsi single-jointed, forming a claw at the end of the tibia; no cerci; metamorphosis very slight. True lice.

1. Body flattened; spiracles only at each side of the mesothorax and on abdominal segments three to eight; antennæ three- or five-jointed; tibia with a thorn-shaped projection..2

   Body thick and stout; mesothorax and metathorax each with a pair of spiracles as well as abdominal segments two to eight; eyes absent; tibia with a stout, short, thorn-like projection; antennæ four- or five-jointed; entire body supplied with thorn-like bristles. (**Echinophthírius.**)..**ECHINOPHTHIRÌIDÆ**

2. Eyes large, convex, distinctly pigmented; fulturæ very strong and broad arms; proboscis short, hardly reaching the thorax. (**Phthírius** [*P. inguinàlis*, Crab-louse] **Pedículus** [*P. cápitis*, Head-louse; *P. vestiménti*, Body-louse]), (Pl. 2, figs. 32, 33) .... PEDICÙLIDÆ
Eyes very indistinct or wanting; fulturæ very narrow and closely applied to the pharynx; beak very long. (**Hæmatopìnus** [*H. ùrius*, Hog-louse].) HÆMATOPÍNIDÆ

ORDER HYMENOPTERA.

(*PHLEBOPTERA.*)

Moderate sized, small or minute, rarely very large; four membranous wings, the fore pair larger and more completely veined; venation rather complete but not complex, sometimes greatly reduced; mouth-parts mandibulate, but the maxillæ usually adapted for lapping liquid food; antennæ variable; ocelli present; prothorax not free; legs similar; tarsi usually five-jointed; abdomen usually with six or seven visible segments; no cerci; ovipositor of female usually sting-like, sometimes saw-like, occasionally greatly elongate. Metamorphosis complete; larvæ legless in the higher forms. Habits variable, phytophagous, predatory, or parasitic. Saw-flies, Wood-wasps, Ichneumon-flies, Ants, Wasps and Bees.

1. Abdomen broadly sessile, attached over a large area (Pl. 4, fig. 83); larvæ with legs present, usually well developed; trochanters two-jointed (Pl. 4, fig. 63); hind wing with three basal cells. Suborder CHALASTOGÁSTRA (=*SYMPHÝTA, SESSILIVÉNTRES, PHYTÓPHAGA, TEREBRÁNTIA*) 2
Abdomen petiolate or subpetiolate, never broadly sessile (Pl. 4, figs. 76, 77); larvæ legless; trochanters one- or two-jointed; hind wing with less than three basal cells. Suborder CLÍSTOGÁSTRA (=*APÓCRITA*) 12
2. Fore wings with three radial cells, *i. e.* two radial crossveins present; antennæ many jointed, but with the three basal joints strongly developed, the third very long. (**Macroxyèla, Xyèla, Odontophýes**) (Pl. 3, fig. 36) XYÉLIDÆ
Fore wings with only one or two radial cells, only one or no radial crossvein present 3
3. Costal cell divided by a distinct longitudinal vein (the subcosta); antennæ slender, becoming very thin apically, many-jointed; radial cell with one crossvein. (**Pamphílius**) (= *Lýda*), **Neurótoma, Bactrócerus** (*LÝDIDÆ*) PAMPHILÌIDÆ
Costal cell not divided 4
4. Anterior tibiæ with a single apical spur 5
Anterior tibiæ with two apical spurs. Saw-flies. (TENTHREDINOÍDEA.) . 8

5. Fore wings with only two cubital cells; antennæ inserted much below the lower margin of the eyes, beneath a frontal ridge; vertex tuberculate. (**Orýssus**) **ORÝSSIDÆ**

Fore wings with three or four cubital cells 6

6. Pronotum nearly truncate or weakly emarginate behind; mesonotum short, not extending much beyond the anterior margin of the tegulæ; abdomen more or less compressed; antennæ filiform, many-jointed. (**Cêphus** [*C. pygmæus*, Wheat-stem Saw-fly], **Jânus.**) . . . . **CÊPHIDÆ**

Pronotum deeply curved or emarginate behind; mesonotum longer, extending well beyond the anterior margin of the tegulæ 7

7. Parapsidal furrows present; fore wings with a transverse intercostal vein; no triangular plate at the apex of the abdomen; prothorax conical. (**Xiphýdria.**) **XIPHYDRÌIDÆ**

Parapsidal furrows absent; fore wings without an intercostal vein; apex of abdomen with a triangularly shaped plate; prothorax subquadrate. (**Trèmex, Sìrex, Paurùrus**) (Pl. 3, fig. 39) (*UROCÉRIDÆ*) . . . . . **SIRÍCIDÆ**

8. First parapterum (a small, more or less triangular plate just behind the prothoracic spiracle and above the mesopleura) present 9

First parapterum absent; mesosternum not separated from the mesopleura by an impressed line (**Acordulécera**) . . . . **PTERYGOPHÓRIDÆ**

9. Abdomen angled laterally so that the dorsal sclerites are sharply divided into a dorsal and ventral surface; antennæ clubbed. (**Címbex** [*C. americana*, Willow Saw-fly], **Trichiosôma, Zaræa**) . . . . **CIMBÍCIDÆ**

Abdomen not sharply angled laterally; antennæ not clubbed 10

10. Mesopleura separated from the mesosternum by an impressed line; antennæ three-jointed, the third joint very long (**Hylótoma**(= *Ârge*), **Sterictíphora**) **HYLOTÓMIDÆ**

Mesopleura not separated by an impressed line; antennæ with more than six joints 11

11. Antennæ serrate (female) or pectinate (male), eighteen- to twenty-six-jointed. (**Diprìon** (= *Lophýrus*) [Pine Saw-flies] . . . . **DIPRIÓNIDÆ**

Antennæ filamentous, with seven to twelve, usually nine, joints. (**Dôlerus, Nématus, Macrôphya, Tenthredélla**) (Pl. 3, fig. 37) . . **TENTHREDÍNIDÆ**

12. Hypopygidium divided, or never closely united with the pygidium, the ovipositor issuing some distance before the tip of the abdomen, from its ventral surface (Pl. 4, fig. 79) 13

Hypopygium entire and closely united with the pygidium, the sting or ovipositor always issuing from the tip of the abdomen (Pl. 4, fig. 82) 44

13. Winged 14

Wingless 25

14. Fore wings with a stigma which is rarely very slender or linear; costal vein well developed as far as the stigma (Pl. 3, figs. 42, 43); abdomen usually with the ventral segments membranous and with a median fold; antennæ usually with more than sixteen joints; wing venation ordinarily well developed. (ICHNEUMONOIDEA.) 15

Fore wings without a stigma, the marginal vein if present, linear, not stigmated; costal vein entirely absent or much thinner than the subcostal (Pl. 3, figs. 44, 46); abdomen with the ventral segments hard and chitinous, without a median fold; antennæ with not more than sixteen joints (in our genera); wings with very incomplete venation 22

15\. Costal and subcostal veins separated, enclosing a narrow costal cell (Pl. 3, fig. 38) 16

Costal and subcostal veins confluent, no costal cell (Pl. 3, fig. 42) 18

16\. Abdomen inserted on the thorax far above the hind coxæ; antennæ with thirteen or fourteen joints. (**Fœnus, Evània, Pristáulacus**) (Pl. 3, figs. 38, 43). EVANÌIDÆ

Abdomen inserted normally, low down and quite close to the hind coxæ... 17

17\. Antennæ fourteen-jointed; body of the abdomen beyond the petiole compressed, ovate or rounded; ovipositor short. (**Roprònia.**)........ ROPRONÌIDÆ

Antennæ very slender, with thirty joints or more; abdomen elongate; ovipositor long. (**Stéphanus.**)............................ STEPHÁNIDÆ

18\. Mandibles abnormal, their attachment reversed so that the cutting edges face outward, laterally instead of inward, and so do not meet when the jaws are closed. (**Dacnùsa, Aphærèta, Alỳsia.**)..................... ALYSÌIDÆ

Mandibles normal, their tips meeting when closed...................... 19

19\. Ventral abdominal segments soft and membranous, with a median fold..... 20

Ventral abdominal segments hard, chitinous, without a median fold; second and third segments covering most of the abdomen. (**Myérsia, Thaumatotypídea.**) MYERSÌIDÆ

20\. Front wings with two recurrent nervures (except in the rare genus Pharsalia); none of the dorsal abdominal segments fused together, all freely movable. (**Ichneùmon, Crỳptus, Limnèrium, Ophìon, Trỳphon, Pímpla**) (Pl. 3, fig. 42; Pl. 4, fig. 63; Pl. 5, fig. 85)...................... ICHNEUMÓNIDÆ

Front wings with only one recurrent nervure (Pl. 3, fig. 40); second and third segments of abdomen usually immovably united.................... 21

21\. Abdomen inserted on the thorax high above the hind coxæ; rare insects. (**Capitònius** (= *Cenocœlius*).)............................ CAPITONÌIDÆ

Abdomen inserted close to the hind coxæ; a very extensive group. (**Lysiphlèbus, Meteòrus, Chelònus, Microgâster, Bràcon, Rhògas**) (Pl. 3, fig. 40; Pl. 4, fig. 76)... BRACÓNIDÆ

22\. Sides of the pronotum extending back to the tegulæ; antennæ not elbowed. Gall Flies. (CYNIPOÍDEA.)................................ 23

Pronotum not extending back to the tegulæ (Pl. 4, fig. 73); antennæ more or less distinctly elbowed. Chalcis Flies (CHALCIDOÍDEA.)............ 30

23\. Dorsal abdominal plates meeting along the venter, and entirely enclosing all the ventral plates, except sometimes a part of the hypopygium. (**Eucóila, Allótria.**)... FIGÍTIDÆ

Dorsal abdominal plates usually extending well down on the sides of the abdomen, but not meeting along the venter; all or nearly all of the ventral plates visible.. 24

24. Basal joint of hind tarsi twice as long as the others united, the second with a long, spined process externally; abdomen greatly compressed, curved like a pruning knife, much longer then the remainder of the body. (**Ibàlia.**) **IBALÌIDÆ**

Basal joint of hind tarsi much shorter; second joint simple. (**Ándricus, Holcáspis, Neuróterus, Synérgus**) (Pl. 3, fig. 46) . . . . **CYNÍPIDÆ**

25. Antennæ distinctly elbowed (Pl. 4, figs. 69, 70, 71). A few genera distributed among the families of Chalcidoídea. (See couplet 30.)

Antennæ not elbowed (Pl 5, fig. 85) 26

26. Mandibles in a reversed position, the tips extending laterally and not meeting when closed (see couplet 18.) . . . . A few **ALYSÌIDÆ**

Mandibles attached normally 27

27. Abdominal petiole expanded apically, not cylindrical (Pl. 5, fig. 85.) 28

Abdominal petiole cylindrical (see couplet 22.) . . . . A few **CYNIPOÍDEA**

28. Ventral abdominal segments soft, with a median fold 29

Ventral segments hard, without a fold. (See No. 19.) . . . . **MYERSÌIDÆ**, part

29. All dorsal abdominal segments free. (See couplet 20.) A few **ICHNEUMÓNIDÆ**

Second and third dorsal segments usually immovably grown together. (See couplet 21.) . . . . A few **BRACÓNIDÆ**

30. Hind wings exceedingly narrow, linear, the base forming a long stalk; ovipositor issuing barely before the tip of the abdomen; antennæ with the scape not elongated, compressed, and without ring joint; very minute species with long wing-fringe. (**Polynêma, Gonatócerus.**) . . . . **MYMÁRIDÆ**

Hind wings never very narrow, not linear or pedunculate at the base; ovipositor issuing decidedly before the tip of the abdomen; antennæ elbowed (Pl. 4, figs. 69, 70, 71), with long scape and usually with from one to three ring joints 31

31. Tarsi five-jointed (rarely four-jointed or less in certain wingless males); axillæ with their anterior margin usually straight and not produced anterior to the tegulæ (Pl. 4, fig. 68); spur of front tibia strong 32

Tarsi three- or four-jointed (five-jointed or heteromerous only in the females of one or two genera); axillæ produced forward, their front margin opposite or anterior to the tegulæ (Pl. 4, fig. 73); spur of front tibia usually weak 42

32. Head of female long, oblong, with a deep longitudinal groove above; front and hind legs very stout, middle ones very slender or aborted; males wingless with short three- to nine-jointed antennæ. Fig insects, mainly tropical. (**Blastóphaga, Eiseniélla.**) . . . . **AGAÓNIDÆ**

Of a different conformation 33

33. Mesopleura with an oblique femoral groove or impression; spur of middle tibia not enlarged 34

Mesopleura entire, always without femoral groove in the female and usually in the male; spur of middle tibia usually very large and stout. (**Eupélmus, Anastàtus, Encýrtus, Ageniáspis**) (including *EUPÉLMIDÆ*). **ENCÝRTIDÆ**

34. Hind tibiæ with two apical spurs....................................35
Hind tibiæ with a single spur; ovipositor rarely long; mandibles usually stout, with three or four teeth at the apex; small black, bronzed or metallic species. (**Pteromàlus, Dibràchys, Spalángia, Diglòchis**) (Pl. 4, fig. 68).
PTEROMÁLIDÆ

35. Mandibles sickle-shaped, usually with one or two teeth within; thorax greatly elevated, scutellum usually much enlarged and produced behind; second abdominal segment very large, generally covering the rest of the abdomen. (**Kápala, Orasêma.**)....................................EUCHÁRIDÆ
Mandibles strong, generally with three or four teeth at apex; thorax not or very slightly elevated; axillæ separated from the mesonotum................36

36. Hind coxæ very large, long; five or six times larger than the front ones.....37
Hind coxæ never (in our genera) very large; not conspicuously larger than the front ones..39

37. Hind coxæ more or less triangular in section, sharply ridged above; ovipositor generally long; hind femora usually simple, rarely swollen and with a tooth beneath; if denticulate beneath, the ovipositor is long. (**Callímome** (= *Torymus*), **Diámorus, Monodontómerus, Podágrion, Ormỳrus**) (*TORÝMIDÆ*).
CALLIMÓMIDÆ
Hind coxæ long, more or less cylindrical, hind femora greatly swollen and toothed or denticulate beneath, their tibiæ curved, and oblique at apex..38

38. Fore wings folded longitudinally in repose; ovipositor long, curving upwards and backwards over the dorsum of the abdomen (**Leucóspis**).
LEUCÓSPIDÆ
Fore wings not folded; ovipositor only very rarely long, then not thus upcurved; tip of abdomen often drawn out as a slender, stiff process. (**Chálcis, Phasgonóphora, Spilochálcis, Smìcra.**)......................CHALCÍDIDÆ

39. Pronotum wide, not, or scarcely narrower than the mesonotum, quadrate...40
Pronotum narrower, usually narrowed in front, or transverse-linear, rarely as wide as the mesonotum..41

40. Abdomen rounded or ovate, more or less compressed, the hypopygium usually produced in the female; second dorsal segment never very large; black or yellowish species. (**Isosòma** [Joint-worms], **Eurýtoma, Decátoma**) (Pl. 4, fig. 72)..EURYTÓMIDÆ
Abdomen subtriangular, small; thorax very large; metallic or submetallic species; second and third dorsal segments occupying most of the surface of the abdomen. (**Perilámpus.**)........................PERILÁMPIDÆ

41. Mesepisternum not large and triangular; none of the femora noticeably swollen; small bronzed or green species. (**Eunòtus, Semiotéllus, Trídymus.**)
MISCOGÁSTRIDÆ
Mesepisternum large and triangular; either the front or hind femora more or less swollen and sometimes serrate; more or less metallic species (**Cheiropáçhys, Cleónymus, Ptinòbius**)......................CLEONÝMIDÆ

42. Hind coxæ normal; mesopleura impressed...........................43
Hind coxæ much enlarged and dilated (Pl. 4, fig. 64), their femora compressed; marginal vein greatly elongated; very small, usually black species. (**Elásmus.**)
ELÁSMIDÆ

43. Tarsi four-jointed (five-jointed or heteromerous in the females of one or two genera); pubescence of wings not placed in rows or lines; wings not usually broad (Pl. 4, fig. 80). (**Tetrástichus, Aphelìnus, Melittòbia, Sympìesis.**) **EULÒPHIDÆ**

Tarsi three-jointed; wings broad, with the pubescence usually arranged in bands or lines; marginal and stigmal veins united to form a strongly recurved stem. (**Pentárthron** (= *Trichográmma*)..............**TRICHOGRAMMÁTIDÆ**

44. Pronotum extending back to the tegulæ, or the latter absent; trochanters sometimes two-jointed..45

Pronotum shortened, more or less collar-shaped (Pl. 4, fig. 75), not extending back on the sides to the tegulæ; trochanters one-jointed................76

45. Trochanters two-jointed, the second joint sometimes difficult to detect in the smaller forms as it is sometimes closely attached to the femur..........46

Trochanters consisting of a single joint 52

46. Mandibles with four teeth; hind wing with two large closed cells; moderate-sized, often brightly colored species. (**Lycogâster.**)....**TRIGONALÒIDÆ**

Mandibles with not more than three teeth; hind wing usually without a closed cell, rarely with one; small or minute, generally black species..........47

47. Antennæ inserted far above the clypeus, near the middle of the face, often on a frontal prominence...48

Antennæ inserted low down on the face, close to the upper margin of the clypeus (Pl. 5, fig. 86) 50

48. Winged...49

Wingless (See couplet 49)............................A few **DIAPRÌIDÆ**

49. Marginal vein in fore wings linear, not triangularly thickened; mandibles with teeth at tip. Wings with or without a basal cell; radial cell in fore wing sometimes present; antennæ usually inserted on a frontal prominence. (**Paramèsius, Tropidòpria, Trichòpria, Belỳta, Pântoclis**) (including *BELÝTIDÆ*)...**DIAPRÌIDÆ**

Marginal vein in fore wings thickened and forming a well developed stigma; mandibles toothed, tip of abdomen simple, fore wings with a closed discoidal cell. (**Helòrus.**)..............................**HELÓRIDÆ**

50. Abdomen acute or sharply marginal along the sides......................51

Abdomen rounded on the sides; wings, when present, with the radial vein developed, but not complete, leaving the radial cell open; no postmarginal vein. (**Cèraphron, Megaspìlus**) (Pl. 5, fig. 85).........**CERAPHRÓNIDÆ**

51. Antennæ ten-jointed, rarely with fewer joints, but never more; front wings without marginal or stigmal veins and usually without a subcostal vein also. (**Polygnòtus, Isocỳbus, Platygâster.**)................**PLATYGÁSTRIDÆ**

Antennæ twelve- or eleven-jointed (if rarely seven- or eight-jointed the club is unjointed, or if ten-jointed the stigmal vein is present); marginal and stigmal vein usually present. (**Telénomus, Tèleas, Caloteléia, Scèlio.**) **SCELIÓNIDÆ**

52. First segment of abdomen forming a scale or node (Pl. 4, fig. 65 (1); fig. 67 (1,2)); second segment often also nodiform, the highly mobile pedicel

strongly differentiated from the remainder of the abdomen; tegulæ absent or much reduced; workers wingless. Ants (**Formìca, Camponòtus, Làsius, Myrmìca, Crematogâster, Ponèra**) (Pl. 4, figs. 65, 67). (Including PONERIDÆ, DOLICHODERIDÆ, MYRMICIDÆ)... .**FORMÍCIDÆ**

First segment of abdomen not scale-like or nodiform, although sometimes constricted at apex..53

53. Winged..54
Wingless, or with the wings reduced in size..72

54. Hind wings without distinct venation, with no closed cells (Pl. 3, fig. 47)...55
Hind wings with well developed venation, with two basal cells and usually with the radius and cubitus extending beyond these (Pl. 3, fig. 53)...........61

55. Mandibles in a reversed position, the apices directed laterally away from the mouth opening; abdomen with only two (female) or three (male) visible dorsal segments, the first covering most of the abdomen (Pl. 5, fig. 84). (**Vanhórnia.**)..**VANHORNÌIDÆ**
Mandibles in the normal position, their tips meeting when closed..........56

56. Hind wings with a lobe at the anal angle, separated by a deep slit-shaped notch..57
Hind wings oval, without a deeply separated angle, although sometimes broadly notched on the hind border..60

57. Abdomen with three or four, rarely five, dorsal segments; metathorax laterally with sharp keels or teeth; ovipositor tubular, extensile, several-jointed; body usually with coarse sculpture and of metallic color. (**Chrŷsis, Hédychrum, Hedychrídium, Parnòpes**) (Pl. 3, fig. 47.)........**CHRYSÍDIDÆ**
Abdomen with at least six dorsal segments; ovipositor sting-like; not brilliantly metallic species..58

58. Head oblong, rather flat above; antennæ inserted at the clypeus, twelve- to thirteen-jointed (twenty-three-jointed in one rare genus); small, usually black or bronzed species, often wingless in the female; abdomen more or less elongate. (**Epŷris, Pseudisobrâchium, Neosclerodérma**)....**BETHÝLIDÆ**
Head not oblong..59

59. Head globose or rounded; antennæ thirteen-jointed in the female, ten-jointed in the male; front tarsi of female simple. (**Ampulicimórpha.**)
EMBOLÉMIDÆ
Head transverse or subquadrate; antennæ ten-jointed; front tarsi of female usually pincers-shaped (Pl. 5, fig. 92). (**Dryìnus, Gonâtopus, Antèon, Bócchus**)..**DRYÍNIDÆ**

60. Fore wings with a broad stigma and a closed, usually very short, radial cell; abdomen with a short, cylindrical petiole, the second segment much longer and larger then the others; small species (Pl. 5, fig. 88). (**Sérphus** (= *Proctotrŷpes*))........................(*PROCTOTRÝPIDÆ*) **SÉRPHIDÆ**
Stigma very long and narrow; radial cell large, widely open apically; abdomen very long and slender, and composed of equal cylindrical segments (female) or clubbed, with the slender first segment as long as the rest of the abdomen (male) (Pl. 3, fig. 41). (**Pelecìnus.**)....................**PELECÍNIDÆ**

61. Wings folded once longitudinally when at rest; first discoidal cell in fore wings extraordinarily lengthened, much longer than the submedian; antennæ distinctly elbowed 62
Wings not folded when at rest 63

62. Tarsal claws simple; mandibles not grooved on outer side; social species, constructing paper-like nests (Pl. 3, fig. 53). (**Polístes** [Paper-wasps], **Véspa** [Hornets and Yellow-jackets]) .... **VÉSPIDÆ**
Tarsal claws with one or more teeth beneath; mandibles with grooves externally; solitary species (Pl. 3, fig. 59). (**Odynèrus, Eùmenes** [Potter-wasps].) **EUMÉNIDÆ**

63. Second ventral segment not separated from the first by a strong constriction or transverse furrow 64
Abdomen with the second ventral segment separated from the first by a strong constriction or transverse furrow; legs very often formed for digging.... 66

64. Legs, especially the hind pair very much lengthened, the hind femora attaining the apex of the abdomen or extending beyond, tibiæ and tarsi nearly always spiny or serrate; middle tibiæ with two spurs. (**Pseudagênia, Psammóchares** (= *Pómpilus*), **Pépsis, Ceròpales.**)
(*CEROPÁLIDÆ, POMPÍLIDÆ*) **PSAMMOCHÁRIDÆ**
Legs much shorter, the tips of the hind femora reaching not or only slightly beyond the middle of the abdomen; tibiæ and tarsi smooth 65

65. Metanotum posteriorly concave; antennæ enlarged at the tip or clubbed, the club joints more or less fused. (**Mâsaris, Pseudomâsaris, Euparàgia.**) **MASÁRIDÆ**
Metanotum truncate or rounded behind; antennæ not thickened apically, none of the joints fused. (**Sapỳga, Eusapỳga.**) .... **SAPỲGIDÆ**

66. Middle coxæ separated (usually widely so) by a bilobed or triangular prolongation of the mesosternum 67
Middle coxæ contiguous, not separated by the mesosternum 69

67. Tarsal claws cleft; male hypopygium ending in an upturned spine 68
Tarsal claws simple; eyes emarginate within; hypopygium of male ending in three spines; usually large, brightly colored wasps (**Scòlia, Èlis.**) **SCOLÌIDÆ**

68. Male with the pygidium deeply emarginate at apex, the eyes emarginate within, the stigma narrow; female with the radial cell in the fore wing closed and often separated from the costa (Pl. 3, figs. 48, 49). (**Myzìne.**) **MYZÍNIDÆ**
Male with the pygidium entire, the stigma broad; female with the radial cell in the fore wing usually open and the first discoidal cell not elongated; eyes entire in both sexes. (**Típhia, Paratíphia.**) .... **TIPHÌIDÆ**

69. Hind wings with an anal lobe, separated by a deep linear notch 70
Hind wings without an anal lobe, at most obtusely emarginate on the posterior basal margin 71

70. Fore wings with the radial and the first and second discoidal cells very long, each fully four times as long as high; abdomen with a long, claviform petiole; rare West Indian insects. (**Rhopalosòma.**) .... **RHOPALOSOMÁTIDÆ**
Fore wings of a different conformation; abdomen either petiolate or sessile. (**Myrmòsa, Chyphòtes.**) .... Males of the **MYRMÓSIDÆ**

71. Cubitus in hind wing originating at or beyond the transverse median nervure; our species small, with shining body. (**Sierolomórpha.**) . . . . **COSÍLIDÆ**
Cubitus in hind wing arising far before the transverse median nervure; body almost always conspicuously pilose (Pl. 3, fig. 45). (**Mutílla, Sphæroph-thálma, Ephùta, Pseudomethòca**) . . . . Males of the **MUTÍLLIDÆ**

72. Thorax undivided, the pro-, meso- and metathorax consolidated into a single piece, without visible sutures between them. (See couplet 71.)
Females of the **MUTÍLLIDÆ**
Thorax with at least one complete transverse suture 73

73. Thorax divided into two parts. (See couplet 70.)
Females of the **MYRMÓSIDÆ**
Thorax divided into three parts 74

74. Head long, usually distinctly longer than broad, flattened above, the front horizontal; legs stout. (See couplet 58.) . . Some females of the **BETHÝLIDÆ**
Head transverse, subquadrate or rounded 75

75. Antennæ twelve-jointed; anterior tarsi not pincers-shaped (**Methòca**)
THÝNNIDÆ
Antennæ ten-jointed; front tarsi usually pincers-shaped (Pl. 5, fig. 92). (**Gon-átopus.**) (See couplet 59.) . . . . **DRYÍNIDÆ**, part
Antennæ thirteen-jointed; wings present as small pads. (See No. 71.)
A few male **MUTÍLLIDÆ**

76. Hind tarsi slender, filiform, the first joint not broadened or thickened; hairs on body simple. Wasps 77
Hind tarsi with the first joint thickened or flattened, often densely hairy; hairs of body feathery or branched. Bees 93

77. Middle tibiæ with a single apical spur, or rarely with none 78
Middle tibiæ with two spurs 86

78. Fore wings with only one cubital cell which is sometimes fused with the first discoidal (Pl. 3, fig. 58) 79
Fore wings with two or three cubital cells (Pl. 3, fig. 52) 81

79. Eyes not emarginate 80
Eyes deeply emarginate within, a second cubital cell indistinctly defined. (See couplet 82.) . . . . **TRYPOXYLÓNIDÆ**

80. First cubital cell separated from the first discoidal; scutellum and postscutel-lum simple, without spines or scales, eyes divergent above. (**Cràbro, Ana-cràbro.**) . . . . **CRABRÓNIDÆ**
First cubital and first discoidal cells confluent; scutellum with a marginal lam-ella on each side; postscutellum with a spine or forked process; eyes con-vergent above. (**Oxýbelus, Notoglóssa.**) . . . . **OXYBÉLIDÆ**

81. Abdomen strongly constricted between the first and second segments 82
Abdomen without a strong constriction between the first and second seg-ments 83

82. Fore wings with two cubital cells; the second usually weakly defined, some-times not indicated; abdomen petiolate, long, slender, and enlarged apically; eyes deeply emarginate within. (**Trypóxylon.**) . . . . . . **TRYPOXYLÓNIDÆ**

Fore wings with three cubital cells; second often petiolate; abdomen sessile or subsessile, usually constricted between the segments; eyes rarely emarginate (Pl. 3, fig. 54). **(Philánthus, Cercèris, Eucercèris.)**. . **PHILÁNTHIDÆ**

83. Abdomen sessile 84

Abdomen petiolate or subpetiolate; two or three cubital cells, transverse median nervure not S-shaped, hind wing usually twice emarginate on the basal half of the posterior border; usually rather small black species. **(Psén, Cemònus, Stígmus, Passalœcus.)** (Including MIMÉSIDÆ and PEMPHREDÓNIDÆ.) **PSÉNIDÆ**

84. Labrum large, free, triangularly elongated beyond the clypeus, much longer than wide; radial cell not divided near the apex; ocelli more or less aborted (Pl. 3, fig. 52). **(Bémbex, Monédula, Microbémbex.)**. . . . . . . **BEMBÉCIDÆ**

Labrum small, usually entirely concealed by the clypeus; radial cell usually divided by a crossvein near apex, the portion beyond the crossvein less clearly defined; at least the front ocellus perfectly formed. 85

85. Second cubital cell petiolate, very rarely absent; third either present or absent; three perfectly formed ocelli; small species. **(Miscòphus, Plenóculus.)** **NITÉLIDÆ**

Second cubital cell present not petiolate; hind ocelli frequently aborted (Pl. 3, fig. 51; Pl. 5, figs. 87, 89). **(Astàta, Lyròda, Tâchysphex, Táchytes.)** **LÁRRIDÆ**

86. Abdomen with a more or less distinct constriction between the first and second segments, the first segment broader at tip than at base; middle coxæ in contact; second cubital cell not receiving a recurrent nervure; rare species. **(Mellìnus.)**. . . . . **MELLÍNIDÆ**

Abdomen not constricted between the first and second segments; middle coxæ separated by the sternum (some metallic green Chrysididæ (see couplet 57) may lead out here; they have the abdomen sessile, with less than six dorsal segments, and the pronotum though long does not quite reach the tegulæ) . 87

87. Mesosternum produced into a forked process posteriorly, the mesepisternum not separated; parapsidal furrows distinct; pronotum conically produced in front. **(Rhinópsis.)**. . . . . **AMPULÍCIDÆ**

Mesosternum not produced backwards, the mesepisternum separated; parapsidal furrows indistinct or absent; pronotum not conically produced. 88

88. Abdomen with a distinct slender, nearly cylindrical petiole (Pl. 3, fig. 57; Pl. 4, figs. 75, 77). **(Chalýbion, Scéliphron** (= *Pelopæus*) **Sphêx** (= *Ammóphila*). **Chloriòn** (= *Sphêx, Prionónyx, Isodóntia*) . . . . **SPHÉCIDÆ**

Abdomen sessile or subsessile, never with a slender petiole. 89

89. Labrum free, well developed, triangular or semicircular, wider than long. **(Stìzus, Sphècius.)**. . . . . **STÍZIDÆ**

Labrum short, not or scarcely exserted beyond the clypeus. 90

90. Marginal cell broadly truncate at apex and prolonged as a small, weakly defined cell; antennæ inserted close to the clypeus or very close to the clypeal suture. **(Ástata, Diploplèctron)**. . . . . Subfamily ASTATÌNÆ of the **NYSSÓNIDÆ**

Marginal cell pointed at apex, not appendiculate; antennæ inserted far above the clypeus, always away from the clypeal suture. 91

91. Fore wings with the second cubital cell petiolate, rarely triangular; mesopleural furrow wanting or indicated only anteriorly....................92
Fore wings with the second cubital cell broadly sessile, not triangular, receiving both recurrent nervures; mesopleural furrow complete, usually deep (Pl. 3, fig. 56). (**Pseudoplìsus, Gorȳtes, Hoplisôdes.**)......**GORȲTIDÆ**

92. Metathorax with the upper hind angles acute or produced as stout spines; pronotum short medially, strongly transverse; short, stout species. (**Nȳsson, Brachystêgus**)..................................**NYSSÓNIDÆ**
Metathorax with the hind angles rounded or obtuse; pronotum subquadrate; slender species. (**Ályson, Didíneis**).....................**ALYSÓNIDÆ**

93. Hind tibiæ without apical spurs; eyes hairy; marginal cell very long. (Pl. 4, fig. 81; Pl. 5, fig. 91.) (**Àpis** [*A. mellífera*, Honey-bee])...........**ÁPIDÆ**
Hind tibiæ with apical spurs...94

94. The cheeks separating the eyes from the mandibles longer than the pedicel of the antennæ; social bees; large, densely hairy species with contrasting black and yellow or sometimes also orange pile. Bumble-bees. (**Bômbus, Psíthyrus**) **BÓMBIDÆ**
Eyes nearly or quite reaching to the base of the mandibles; solitary bees of different appearance..95

95. Tongue short, broad, obtuse and emarginate at apex (COLLETIFÓRMES)..96
Tongue more or less elongate, pointed and not emarginate; no ventral abdominal brush of hairs. (ANDRENIFÓRMES).........................97
Tongue long and very slender. (Pl. 5, fig. 91.).........................99

96. Black bees with little hair; fore wings with only two cubital cells; face almost always with yellow or white markings; nearly always small species. (**Prosôpis**)..**PROSÓPIDÆ**
Hairy bees; fore wings with three cubital cells; moderate-sized species. (**Collêtes**) ....**COLLÉTIDÆ**

97. Tongue more or less short, dagger-like; radial cell pointed; usually three cubital cells; maxillary palpi six-jointed; burrowing bees. (**Andrèna, Halíctus, Augochlôra, Agapóstemon, Sphecôdes.**)..................**ANDRÉNIDÆ**
Tongue elongate, though not so long as in some of the higher groups; only two submarginal cells (except in Protandrèna which has three); never brilliantly metallic, though rarely with the head and thorax green; often with yellow markings. (**Panúrgus**)............................**PANÚRGIDÆ**
Tongue elongate; parasitic bees, usually highly ornamented, and with no pollen-collecting apparatus.....................................98
Tongue very long; first two joints of labial palpi elongate, sheath-like, last two minute; hairy, pollen-collecting bees, the males often with long antennæ, and usually with the clypeus yellow. **Melissôdes, Anthóphora, Hemísia** (=*Céntris*), **Diadàsia**)....................**ANTHOPHÓRIDÆ**

98. Maxillary palpi six-jointed; usually wasp-like in appearance, with bright yellow and often red colors; almost always with three cubital cells; marginal cell pointed on costa. (**Nómada**)........................**NOMÁDIDÆ**
Maxillary palpi two- to six-jointed; usually robust bees with conspicuous markings due to hair, but without yellow tegumentary markings. (**Epêolus, Triepêolus, Bombomelécta, Neopasìtes.**)..................**MELÉCTIDÆ**

99. Fore wings with two cubital cells; labial palpi with the basal joints much elongated, the apical minute; underside of abdomen of female with a pollen-collecting scopa, except in the parasitic genera. (**Cœliôxys, Megachìle, Herìades, Ósmia, Stèlis, Anthídium.**)..................MEGACHÍLIDÆ
Fore wings always (in our species) with three cubital cells, the marginal cell narrow and as long as the cubitals united..........................100

100. Hind tibia and tarsus of female with a dense pollen-collecting scopa; stigma obsolete; large robust bees, mainly tropical. (**Xylôcopa**)..XYLOCÓPIDÆ
Hind tibia and tarsus of female without distinct scopa; stigma large; small bees. (**Cerâtina**)..................................CERATÍNIDÆ

ORDER COLEOPTERA.

(*ELEUTERATA; ELYTHROPTERA.*)

Moderate-sized, small or minute, more rarely very large, hard-bodied insects; head free, usually prominent; mandibles well developed; antennæ ten- or eleven-jointed, sometimes less, very rarely more; ocelli nearly always absent; prothorax free; two pairs of wings, the front pair (elytra) thickly chitinized, sheathing the meso- and metathorax and also nearly always the abdomen, almost always meeting in a straight line down the middle of the back; hind wings occasionally absent; legs homonomous, the tarsi usually with five or four joints; no cerci. Metamorphosis complete, the larvæ mandibulate. A very large and widely distributed group, including beetles and weevils.

1. First ventral segment divided by the hind coxal cavities (except the rare Cupedidæ) so that the sides are separated from the very small median part, the first three ventral segments immovably united; antennæ thread-like or nearly so; hind wings with one or two crossveins near the middle, connecting the first and second branches of the media (Pl. 7, figs. 158, 159); almost always carnivorous and predatory. Suborder ADÉPHAGA............2
First ventral segment visible for its entire breadth; wing without such crossveins (Pl. 7, figs. 160, 161). Suborder POLÝPHAGA.................8

2. First three ventral segments immovably united..........................3
Abdomen with five free ventral segments; metasternum with a piece in front of the hind coxæ marked off by a distinct suture; rare bark beetles. (**Cùpes.**)
CUPÉDIDÆ

3. Metasternum with a transverse triangular antecoxal sclerite separated by a well marked suture, reaching from one side to the other and extending between the hind coxæ (Pl. 6, fig. 108)....................................4
Metasternum with a short antecoxal sclerite, not prolonged posteriorly between the coxæ, the suture indistinct; rare semiaquatic beetles. (**Amphizôa.**)
AMPHIZÒIDÆ

Metasternum without an antecoxal sclerite 6

4. Antennæ eleven-jointed; hind coxæ movable and simple; terrestrial 5

Antennæ ten-jointed; hind coxæ fixed, expanded so as almost to conceal the base of the abdomen (Pl. 4, fig. 124); small water beetles. (**Cnemidòtus, Háliplus.**) . . . . **HALÍPLIDÆ**

5. Antennæ inserted on the front, above the base of the mandibles; eyes prominent; head vertical, wider than the thorax. Tiger-beetles. (**Cicindèla, Ómus, Tétracha.**) . . . . **CICINDÉLIDÆ**

Antennæ inserted on the sides of the head, between the base of the mandibles and the eyes; head usually held horizontally and generally narrower than the thorax. Ground beetles. (**Ómophron, Calosòma** [Caterpillar-hunter], **Bembídium, Plátynus, Brachìnus** [Bombadier beetle], **Pteróstichus, Hárpalus, Chlænius**) (Pl. 5, fig. 97; Pl. 6, fig. 108; Pl. 7, figs. 158, 164). **CARÁBIDÆ**

6. Metasternum prolonged behind as a triangular process; aquatic 7

Metasternum not prolonged between the coxæ; scutellum absent; antennæ formed like a string of beads; rare bark beetles. (**Rhysòdes**) (Pl. 7, fig. 146.) **RHYSÓDIDÆ**

7. Antennæ slender, abdomen with six segments; eyes two. Diving beetles, Water-tigers. (**Dytíscus, Cybíster, Acílius, Ágabus, Colymbètes**) (Pl. 5 fig. 101) . . . . **DYTÍSCIDÆ**

Antennæ short, abdomen with seven segments; eyes four. Whirligig beetles. (**Gyrìnus, Dineùtes**) (Pl. 6, fig. 117; Pl. 7, fig. 147) . . . . **GYRÍNIDÆ**

8. Antennæ clubbed or not, if clubbed, not lamellate 9

Antennæ with the last three to seven joints enlarged on one side to form a comb-like or lamellate club which can often be opened and closed (Pl. 7, figs. 149, 150, 151); legs often fitted for digging; tarsi almost always five-jointed, front tarsi of some dung beetles may be absent; larvæ with thick curved body and well-developed legs. (Lamellicórnia.) 114

9. Head not prolonged into a beak; palpi flexible, gular sutures double, at least before and behind; prosternal sutures distinct, proëpimera not meeting behind the prosternum 10

Head generally prolonged and snout-like (*Pl. 6, fig. 125*), palpi nearly always rigid; gular sutures confluent medially; proëpimera united behind the prosternum, prosternal sutures wanting, antennæ often elbowed; fourth tarsal joint usually indistinct; larvæ legless or with short legs. (Rhynchóphora.) 110

10. Fourth and fifth tarsal joints not immovably united, the articulation between them like those between the other joints (Pl. 7, figs, 143, 168) (If rarely immovably united as in some Erotylidæ, the antennæ are clavate) 11

Fourth tarsal joint minute, fused with the fifth; tarsi usually densely pubescent below, the first three joints dilated and with a sole, the third joint usually bilobed (Pl. 7, figs. 157, 167); antennæ thread-like, rarely serrate or thickened apically; plant feeders. (Phytóphaga.) 108

11. Hind tarsi with at least as many joints as the others 12

Hind tarsi four-jointed, front and middle tarsi five-jointed. (Heterómera.) 86

12. Maxillary palpi slender, almost always as long as or longer than the antennæ; antennæ six- to nine-jointed, the outer joints forming a pubescent, distinct club; usually aquatic, convex beetles. Larvæ usually with cerci. (PALPICÓRNIA.) Water scavenger beetles. (**Hydróphilus, Laccòbius, Hydròbius, Cercỳon**) (*Pl. 6, figs. 110, 111*) .... **HYDROPHÍLIDÆ**
    Maxillary palpi much shorter than the antennæ; larvæ never with cerci. (DIVERSICÓRNIA, POLYMÓRPHA, or CLAVICÓRNIA and SERRICÓRNIA) 13
13. Elytra short, exposing much of the abdomen; dorsal segments of abdomen entirely horny in texture; wings usually present and folded beneath the elytra, crossveins absent 14
    Elytra covering most of the abdomen, rarely much shortened, in which case the wings are wanting, or not folded beneath the elytra; dorsal segments partly membranous 15
14. Abdomen flexible, seven or eight ventral segments, body usually slender; scavengers. Rove beetles. (**Stènus, Staphylìnus, Tachỳporus, Philónthus**) (Pl. 5, fig. 95) .... **STAPHYLÍNIDÆ**
    Abdomen not flexible, five or six ventral segments; small or minute, robust beetles. (**Bryàxis, Batrisòdes**) (Pl. 7, figs. 138, 148) .... **PSELÁPHIDÆ**
15. Tarsi five-jointed on at least one pair of legs, and almost always on all pairs .. 16
    All tarsi with less than five joints 65
16. Last tarsal joint long and with very large claws (Pl. 7, fig. 143); first three ventral segments grown together; small aquatic or subaquatic beetles. (**Psephènus, Drỳops, Élmis**) (*DRYÓPIDÆ*) .... **PÁRNIDÆ**
    Tarsal claws normal; all ventral segments free except in the Colydiidæ, Heteroceridæ, Buprestidæ and some Byrrhidæ which are not aquatic 17
17. Abdomen with five ventral segments 18
    Abdomen with at least six ventral segments 50
18. Front coxæ globular or transverse, usually projecting but little from the coxal cavity; trochanters never interstitial 19
    Front coxæ more or less conical and prominent 37
19. Front coxæ transverse, more or less cylindrical 20
    Front coxæ globular 27
20. Hind coxæ grooved to receive the femora 21
    Hind coxæ flat and not grooved 26
21. Strongly convex beetles with more or less retractile legs, tibiæ dilated and usually grooved near the outer end to receive the tarsi, tibial spurs distinct 22
    Slightly convex oval species with non-retractile slender legs; tibial spurs more or less reduced 24
22. Antennæ inserted at sides of head 23
    Antennæ inserted on front, head retracted; third tarsal joint lobed; thorax margined; oval tropical species (**Chelonàrium**) .... **CHELONARÌIDÆ**
23. Head prominent, mentum large, elongate and subelliptical; tarsi not lobed. (***Nosodéndron.***) .... **NOSODÉNDRIDÆ**
    Head retracted, mentum small and quadrate; (**Amphicỳrta, Býrrhus**). **BÝRRHIDÆ**

24. Front coxæ with distinctly separated side-piece (trochantin). **(Dascýllus.)** **DASCÝLLIDÆ**

Front coxæ without trochantin 25

25. Posterior coxæ at most moderately dilated internally. **(Cýphon)** (Pl. 7, figs. 127, 129.) *(CYPHONIDÆ.)* .... **HELÓDIDÆ**

Posterior coxæ very large. **(Eucinètus.)** .... **EUCINÉTIDÆ**

26. Tarsi more or less dilated, the first joint not shortened, fourth joint very small; elytra usually not extending to the tip of the abdomen. **(Carpóphilus, Omosìta, Nitídula)** .... **NITIDÙLIDÆ**

Tarsi slender, metatarsus short; elytra entire, never truncate, covering the abdomen. **(Tenebriòides, Péltis)** (Pl. 7, fig. 135) *(TROGOSÍTIDÆ, TEMNOCHÎLIDÆ.)* .... **OSTOMÁTIDÆ**

27. First and second ventral segments fused or immovably united; antennæ serrate (pectinate in the male of Xenorhepis; tarsi with membranous lobes beneath; hard-bodied beetles, of more or less metallic color. **(Chalcóphora, Chrysobóthris** [*C. femorata*, Flat-head orchard-borer], **Buprèstis, Agrìlus)** (Pl. 5, fig. 98.) .... **BUPRÉSTIDÆ**

All ventral segments free, except in very rare cases 28

28. Prosternum prolonged behind into a process which is received in the mesosternum 29

Prosternum without such backwardly directed process 31

29. Prothorax loosely joined to the mesothorax, freely movable, its hind angles usually prolonged backward into teeth; prosternal spine loosely received in a notch in the mesosternum; front coxal cavities contained entirely in the prosternum 30

Prothorax firmly attached, not movable; front coxal cavities closed behind by the mesosternum. **(Drapètes, Thróscus.)** .... **THRÓSCIDÆ**

30. Labrum visible; prosternum lobed in front; beetles capable of moving the prothorax by its basal joint with a sudden clicking motion. Click-beetles, Wireworm beetles. **(Alàus, Élater, Melanòtus, Drastèrius, Limònius)** (Pl. 7, fig. 126, 128.) .... **ELATÉRIDÆ**

Labrum concealed; prosternum not lobed in front; antennæ inserted on the front, somewhat distant from the eyes; not able to leap by the prothoracic joint. **(Fórnax, Microrhàgus)** .... **EUCNÉMIDÆ**

31. Hind coxæ in contact; body very small, convex, oval or rounded-oval. **(Phâlacrus, Ólibrus.)** .... **PHALÁCRIDÆ**

Hind coxæ not in contact, although closely approximate in certain very much flattened species 32

32. Elytra shortened, leaving two segments of the abdomen uncovered, antennæ elbowed, very strongly clavate; tibiae compressed, front pair usually toothed. **(Híster, Saprìnus, Hololépta)** (Pl. 7, fig. 141.) .... **HISTÉRIDÆ**

Elytra entire 33

33. Tibiae dilated and toothed externally; large tropical beetles with strongly clubbed antennæ. **(Syntèlia.)** .... **SYNTELÌIDÆ**

Tibiæ simple or linear, at most the front pair somewhat dilated 34

34. Middle coxal cavities open externally, *i. e.* not closed by the meeting of the meso- and metasterna; body elongate, greatly flattened. (**Silvànus, Cùcujus, Læmophlœus, Brôntes**) (Pl. 5, fig. 96.)...............**CUCÙJIDÆ**
Middle coxal cavities closed externally by the sterna....................35

35. Prosternum not prolonged. (See couplet 74.)
Tribe DIPHYLLINI of the **MYCETOPHÁGIDÆ**
Prosternum prolonged behind, meeting the mesosternum................36

36. Front coxal cavities open behind (Pl. 6, fig. 114); small or minute species. (**Atomària, Cryptôphagus**).........................**CRYPTOPHÁGIDÆ**
Front coxal cavities closed behind (Pl. 6, fig. 119); larger beetles, usually black, with orange-red spots. (**Megalodàchne**) (Pl. 7, fig. 168).
Group DÁCNES of the **EROTÝLIDÆ**

37. Hind coxæ dilated into plates which are grooved for the reception of the femora..38
Hind coxæ not thus dilated, nor grooved for the reception of the femora....42

38. Front coxal cavities closed behind (Pl. 6, fig. 119)......................39
Front coxal cavities open behind (Pl. 6, fig. 114).........................40

39. Second and third joints of tarsi lobed beneath; plate of hind coxæ feeble; small, pubescent beetles. (**Bytùrus.**)...........................**BYTÙRIDÆ**
Tarsi simple, not lobed; small, coarsely punctured beetles. (**Derodôntus.**)
DERODÓNTIDÆ

40. Antennæ with the last three joints much enlarged, forming a strong club; small, or rather small, often scaly beetles. (**Dermèstes** [*D. lardàrius*, Larder-beetle] **Attagènus, Anthrènus** [Museum-beetle, Carpet-beetle]) (Pl. 5, fig. 94; Pl. 7, fig. 152)............................**DERMÉSTIDÆ**
Antennæ not capitate...41

41. Tarsi with a large, hairy pad (onychium) between the claws; moderate-sized or large, elongate-oval beetles; tibial spurs present, small. (**Sándalus.**)
RHIPICÉRIDÆ
Onychium not developed or very small; no tibial spurs. (**Sitodrèpa, Anòbia**) (Pl. 7, fig. 131.)......................................**ANOBÌIDÆ**

42. First joint of tarsi very short and indistinctly separated from the second..43
First joint of tarsi distinct, when rarely very short, the first ventral segment is not elongated and the head not deflexed..........................44

43. First ventral segment elongated, always much longer than the second; antennæ with a quite distinct two-jointed club; small elongate beetles with prominent head not covered by the prothorax. Powder-post beetles. (**Lýctus**) (Pl. 5, fig. 103.)..**LÝCTIDÆ**
First ventral segment not elongated; antennal club three- or four-jointed; head usually deflexed and protected by the prothorax; declivity of elytra often toothed or spined; elongate, more or less cylindrical beetles. (**Sinóxylon, Bóstrychus, Polycàon** [*P. confértus*, Prune-twig borer], **Schistóceros** [*S. hamàtus= Amphícerus bicaudàtus*, Apple-twig borer]) (*APÁTIDÆ*)
BOSTRÝCHIDÆ

44. Hind coxæ flat or oval, not prominent.................................45
Hind coxæ prominent internally, more or less conical....................48

45. Fourth joint of tarsi extremely short, not visible from above; small beetles of rather bright colors. (**Necròbia, Phyllobænus, Pytícera**) (Pl. 7, fig. 133.) CORYNÉTIDÆ
Fourth joint of tarsi not abnormally short 46

46. Fifth segment of abdomen conically produced, as long as the three preceding ones; elytra not covering the abdomen completely. (**Scaphídium, Bæócera, Scaphisòma**) .... SCAPHIDÌIDÆ
Fifth abdominal segment not elongated nor conically produced 47

47. Trochanters attached to the internal margin of the femora. (**Trichòdes, Clèrus, Thanâsimus**) (Pl. 7, fig. 132.) .... CLÉRIDÆ
Trochanters interstitial, *i. e.* attached to the base of the femora. (**Ptìnus, Mèzium.**) .... PTÍNIDÆ

48. Antennæ capitate, *i. e.* the last three joints forming an abrupt club; elytra truncate. (**Sphærìtes.**) .... SPHÆRÍTIDÆ
Antennæ simple, not clubbed 49

49. Front coxæ with a distinct side piece (trochantin). (See couplet 61.) Some MALACHÌIDÆ
Front coxæ without trochantin; long, narrow beetles. (**Lymèxylon.**) LYMEXYLÓNIDÆ

50. Front coxæ flat, rounded or globular, small and not prominent 51
Front coxæ conical, prominent, usually large 54

51. Front coxæ flat, elytra not longer than the prothorax, exposing five abdominal segments; small wingless beetles parasitic on beavers. (**Platypsýllus.**) PLATYPSÝLLIDÆ
Front coxæ rounded or globular; not such beetles 52

52. Prosternum prolonged behind into a process which is received in a notch in the mesosternum; prothorax loosely attached to the mesothorax 53
Prosternum without such a backwardly directed process; eyes very small or wanting; rare minute beetles living in the nests of rodents. (**Leptìnus.**) LEPTÍNIDÆ

53. Labrum fused with the front; antennæ distant at base. (**Cèbrio, Scaptolènus.**) CEBRIÓNIDÆ
Labrum free. (**Plastócerus, Euthysànius.**) .... A very few Elateridæ

54. Abdomen with six ventral segments 55
Abdomen with seven or eight ventral segments 63

55. Fifth segment of abdomen conical, as long as the three preceding segments together, the sixth minute. (See couplet 46.) .... SCAPHIDÌIDÆ
Fifth segment not conical nor excessively elongated 56

56. Hind coxæ flat, not prominent, covered by the femora in repose; first joint of posterior tarsi usually very short and indistinct 57
Hind coxæ prominent, at least internally 58

57. Tarsi with the fourth joint of normal size; pronotum continuous with the propleura (see couplet 46) .... CLÉRIDÆ
Tarsi with the fourth joint very small and indistinct; pronotum separated from the flanks by a marginal line (see couplet 45) .... CORYNÉTIDÆ

58. Hind coxæ widely separated 59
Hind coxæ approximated or contiguous 60

59. Eyes absent (see couplet 60) .... A few **SÍLPHIDÆ**
Eyes present, coarsely granulated; small, more or less ovate, brown beetles. (**Eucónnus, Cónnophron.**) .... **SCYDMÆNIDÆ**

60. Tibial spurs large, antennæ gradually thickened or clavate; hind tarsi slender, not widened. Carrion-beetles (**Necróphorus, Sílpha, Ptomóphagus**) (Pl. 6, fig. 109; Pl. 7, figs. 136, 137, 139, 140) .... **SÍLPHIDÆ**
Tibial spurs small or indistinct 61

61. Front coxæ with a distinct side piece (trochantin); rather small, usually soft-bodied species. (**Malâchius, Côllops**) (*MELÝRIDÆ*) .... **MALACHÌIDÆ**
Front coxæ without trochantin 62

62. Elytra shortened, exposing several of the abdominal segments; very small species. (**Micromâlthus.**) .... **MICROMÁLTHIDÆ**
Elytra entire. (**Lyméxylon, Hylocœtus.**) .... **LYMEXYLÓNIDÆ**

63. Middle coxæ distant; epipleuræ wanting; elytra usually with a reticulate sculpture; no phosphorescent organs. (**Calópteron, Èros.**) .... **LÝCIDÆ**
Middle coxæ in contact; epipleuræ distinct; elytra not reticulate 64

64. Episterna of metathorax sinuate on the inner side; head nearly or quite covered by the thorax; epipleuræ usually wide at the base of the elytra; phosphorescent organs generally present. Fire-flies. (**Lucidôta, Ellýchnia, Photìnus, Photùris, Phengôdes.**) .... (*MALACODÉRMIDÆ*) **LAMPÝRIDÆ**
Episterna of metathorax not sinuate on inner side; head not at all covered by the thorax; epipleuræ narrow at the base; no phosphorescent organs. (**Chauliógnathus, Podâbrus, Telêphorus.**) .... **TELEPHÓRIDÆ**

65. Tarsi four-jointed, front ones three-jointed in the males of some Mycetophagidæ 66
Tarsi with three joints or less 76

66. Wings fringed with long hairs 67
Wings not fringed 68

67. Hind coxæ in contact, with plates at least partially covering the femora. (**Clâmbus, Calyptomèrus.**) .... **CLÁMBIDÆ**
Hind coxæ distant, transverse, not laminate; third joint of tarsi small, concealed in the bilobed second joint. (**Corylophôdes, Molâmba.**) (*CORYLÓPHIDÆ.*) .... **ORTHOPÉRIDÆ**

68. Ventral segments all free and movable 69
Ventral segments one to four firmly united, immovable 75

69. First tarsal joint greatly dilated, overlapping the very minute second and third joints and a part of the long fourth joint; minute tropical beetles (**Adimèrus**) (Pl. 7, fig. 163) .... **ADIMÉRIDÆ**
First tarsal joint not thus dilated 70

70. Front coxæ transverse; minute fungus beetles (**Cybocéphalus**) (see couplet 26). **NITIDÙLIDÆ**, part
Front coxæ not transverse 71

71. Front coxæ globose..72
Front coxæ oval..73

72. Tarsi slender, third joint distinct, but shorter than the second; very small species. (**Rhýmbus, Rhànis**) (Pl. 7, fig. 142)..........**MYCETÆIDÆ**
Tarsi more or less dilated and spongy beneath; elongate beetles with hard body and strongly clubbed antennæ. (**Langùria, Trítoma, Eròtylus.**) **EROTÝLIDÆ**

73. Front coxæ almost in contact, prosternum more or less membranous, not visible between them. (**Georýssus.**)..................**GEORÝSSIDÆ**
Front coxæ well separated by the horny prosternum....................74

74. Head more or less concealed by the projecting prothorax; body cylindrical. (**Cís, Enneârthron.**)......................................**CIÒIDÆ**
Head free, not covered by the prothorax; body oval, depressed, pubescent. (**Mycetóphagus, Litârgus.**).......................**MYCETOPHÁGIDÆ**

75. Antennæ thickened, or with a two-jointed club; tibiæ simple, not dilated nor spinose. (**Dítoma, Cérylon, Philothérmus.**)...............**COLYDÌIDÆ**
Antennæ with a large serrate, seven-jointed club; front and middle tibiæ dilated and armed with rows of spines. (**Heterócerus**) (Pl. 7, fig.144). **HETEROCÉRIDÆ**

76. Tarsi three-jointed..77
Tarsi with less than three joints...85

77. Wings fringed with long hairs..78
Wings not fringed...80

78. Abdomen with only three ventral segments; very small, rare beetles occurring beneath stones in the Pacific region. (**Sphærius.**)........**SPHÆRÌIDÆ**
Abdomen with six or seven ventral segments..........................79

79. Antennæ slender, nine- to eleven-jointed, with whorls of long hairs; very minute, shining beetles found on foliage. (**Nossídium, Trichópteryx, Nephànes.**) (*TRICHOPTERÝGIDÆ.*)...................**PTILÌIDÆ**
Antennæ short, eight-jointed, thickened apically; a rare aquatic beetle from California. (**Hydroscàpha.**).....................**HYDROSCÁPHIDÆ**

80. Second joint of tarsi dilated; the third joint consisting really of two joints, the small, true third joint being fused with the base of the last joint, which thus appears as the third..81
Second tarsal joint not dilated...82

81. Tarsal claws dilated or toothed at the base; first ventral segment with curved coxal lines; small, rounded, convex, usually brightly spotted beetles. "Lady-birds" (**Coccinélla, Hippodamìa, Adâlia, Megílla, Anàtis, Epilâchna**) (Pl. 6, figs. 118, 120, 121, 123).......................**COCCINÉLLIDÆ**
Tarsal claws simple, first ventral segment without coxal lines; small, oblong or oval beetles, often with a striking color pattern. (**Endómychus, Lycoperdìna, Aphorísta.**)............................**ENDOMÝCHIDÆ**

82. Elytra entire..83
Elytra truncate, exposing the last abdominal segment..................84

83. Body broadly oval, convex; tropical beetles. (**Aphænocéphalus**) (*DISCOLÓMIDÆ, PSEUDOCORYLÓPHIDÆ*)............**APHÆNOCEPHÁLIDÆ**
Body more elongate, the prothorax narrower than the elytra and often marked with elevated lines. (**Corticària, Cartodère, Melanophthàlma**) (Pl. 7, fig. 145)...**LATHRIDÌIDÆ**

84. Front coxæ subtransverse; maxillæ with a single lobe. (Tribe Smicriptini, a rare beetle from Florida) (**Smìcrips.**)...............**NITIDÙLIDÆ, part**
Front coxæ small, rounded; maxillæ bilobed; small, flattened bark beetles. (**Monótoma, Bactrídium.**)..........................**MONOTÓMIDÆ**

85. Tarsi apparently two-jointed, but with the second and third joints very minute. (Pl. 7, fig. 163). (See couplet 69)......................**ADIMÉRIDÆ**
Tarsi one-jointed; minute tropical beetles with four-jointed antennæ (**Cyathócerus**)....................................**CYATHOCÉRIDÆ**

86. Front coxal cavities closed behind (Pl. 6, fig. 119)......................87
Front coxal cavities open behind (Pl. 6, fig. 114).......................93

87. Tarsal claws simple...88
Tarsal claws pectinate; usually elongate, convex thinly silky-pubescent beetles. (**Hyménorus, Mycetóchares**) (*ALLECÙLIDÆ*)...........**CISTÉLIDÆ**

88. *Ventral segments all freely movable (If the mesosternum is carinate, compare* some rare Silphidæ, couplet 60)...................................89
First two to four ventral segments more closely connected together, more or less fused and immovable...91

89. *Front coxal cavities separated by the prosternum (Pl. 6, fig. 119).........90*
Antennæ eleven-jointed; front coxal cavities confluent (**Óthnius**) **OTHNÌIDÆ**

90. Elytra entire; small convex beetles (**Sphíndus**)..............**SPHÍNDIDÆ**
Elytra truncate, exposing the pygidium; small flattened beetles (males of **Rhizóphagus**) (see couplet 26)........................**NITIDÙLIDÆ**

91. Five ventral segments...92
Six ventral segments, the first two immovably united; a small black beetle from Alaska. (**Ægialìtes.**) ....**ÆGIALÍTIDÆ**

92. Penultimate joint of tarsi spongy pubescent beneath; front coxæ prominent; slender, elongate species with cylindrical prothorax, usually of somewhat metallic color. (**Arthromàcra, Statìra.**) ....**LAGRÌIDÆ**
Penultimate joint of tarsi not spongy pubescent beneath; front coxæ short, not projecting from the cavities; beetles of varying form, oval, elongate, or even pedunculate, usually black or dark colored with more or less bead-like joints to the antennæ. (**Nyctóbates, Tenèbrio** [*T. mólitor*, Mealworm] **Blapstìnus, Platýdema, Diapèris, Eleòdes**) (Pl. 5, fig.105) **TENEBRIÓNIDÆ**

93. Head not strongly or suddenly narrowed or constricted behind the eyes....94
Head strongly and suddenly constricted behind the eyes.................99

94. Middle coxæ not noticeably prominent..............................95
Middle coxæ very prominent; prothorax without lateral margin; penultimate tarsal joint dilated and with a dense brush of hairs beneath; soft-bodied species. (**Nacérdes, Asclèra, Copidìta.**)................**ŒDOMÉRIDÆ**

95. Antennæ received in grooves on the underside of the prothorax; small, black, oval, flattened beetles. (**Hyporhàgus.**) . . . . **MONÓMMIDÆ**
Antennæ free, not received in grooves 96

96. Prothorax with a sharp lateral margin 97
Prothorax not margined laterally, narrowed behind, its disk without impressions. (**Pỳtho, Bòros**) . . . . **PÝTHIDÆ**

97. Epimera of the mesothorax not reaching the coxæ, the coxal cavities entirely surrounded by the sterna (Males of several genera) (see couplet 36)
CRYPTOPHÁGIDÆ, part
Epimera of mesothorax attaining the coxæ 98

98. Metasternum long; epimera of metathorax visible; prothorax widened toward the base; its disk with basal impressions (**Pénthe, Eustròphus, Melándrya, Synchròa**) . . . . **MELANDRÝIDÆ**
Metasternum quadrate; epimera of metathorax covered. (Males of several genera) (see couplet 33) . . . . **CUCÙJIDÆ**, part

99. Head prolonged behind and gradually narrowed; prothorax not margined, as wide as the elytra at base. (**Cephalòön**) . . . . **CEPHALOÖNIDÆ**
Head suddenly narrowed behind 100

100. Prothorax with a sharp lateral margin 101
Prothorax without a sharp lateral margin, rounded on the sides 103

101. Antennæ thread-like 102
Antennæ pectinate (male) or subserrate (female); tarsal claws serrate or toothed. (**Plecótoma**) . . . . . . Tribe Evaniocerìni of the **RHIPIPHÓRIDÆ**

102. Hind coxæ furnished with flattened plates; head placed vertically against the thorax; body conically narrowed behind, the abdomen usually prolonged and pointed at tip; small beetles. (**Mordellístena, Mordélla, Tomóxia**) (Pl. 7, fig. 166) . . . . **MORDÉLLIDÆ**
Hind coxæ without flattened plates, transverse. (**Cánifa.**) . . **SCRAPTÌIDÆ**

103. Base of prothorax narrower than the elytra 104
Base of prothorax as wide as the elytra; body broad, much narrowed behind; elytra usually shortened and narrowed behind. (**Rhipíphorus, Myodìtes.**)
RHIPIPHÓRIDÆ

104. Hind coxæ not prominent; tarsal claws simple 105
Hind coxæ large and prominent 107

105. Eyes more or less emarginate 106
Eyes elliptical, entire, rather coarsely granulated. (**Macràtria, Notóxus, Ánthicus**) . . . . **ANTHÍCIDÆ**

106. Head constricted far behind the finely granulated eyes. (**Corphỳra.**)
PEDÍLIDÆ
Head constricted just behind the coarsely granulated eyes. (**Hylóphilus.**)
HYLOPHÍLIDÆ

107. Tarsal claws simple; head horizontal; antennæ serrate, often pectinate in the male; body flattened; moderate sized beetles. (**Pyrochròa, Dendròides**) (Pl. 7, fig. 130) . . . . **PYROCHRÒIDÆ**

Tarsal claws toothed or cleft; head deflexed, with the front vertical; elytra *often shortened;* body more or less cylindrical; moderately large beetles. Blister beetles (**Meloë, Nemógnatha, Macróbasis, Epicáuta, Pomphopœa**) (Pl. 5, fig. 99) (*CANTHÁRIDÆ LYTTIDÆ*)..............MELÒIDÆ

108\. Submentum pedunculate, *i. e.* the mentum supported at its base by a narrow portion or peduncle; antennæ serrate; head prolonged into a broad *muzzle;* elytra shortened so as to expose the pygidium. Pea and bean weevils. (**Brùchus** [*B. obtéctus*, Bean-weevil; *B. pisòrum*, Pea-weevil], **Spermóphagus**) (Pl. 5, fig. 102) (*LARÌIDÆ, MYOLÁBRIDÆ*).............BRÙCHIDÆ

Submentum not pedunculate; head not prolonged into a broad beak; antennæ *rarely distinctly serrate*..109

109\. Antennæ usually long or greatly developed, frequently inserted on frontal prominences; front often vertical, large and quadrate; pronotum rarely margined; tibial spurs distinct; usually rather large, elongate or oblong beetles with parallel sides and pubescent upper surface. Longicorns. (**Parándra, Elaphídion** [Twig-pruners], **Cyllêne** [*C. robíniæ*, Locust-borer], **Monohámmus, Sapérda** [*S. cándida*, Round-head apple-borer], **Tetraòpes**) including *SPONDŸLIDÆ*. (Pl. 5, fig. 100; Pl. 7, fig. 167.)
CERAMBŸCIDÆ

Antennæ moderate or short, not inserted on frontal prominences; front small, oblique, sometimes inflexed; pronotum most frequently margined; tibial spurs usually wanting; small or moderate sized; body usually glabrous above and very often brightly colored; rather oval in form. Leaf Beetles. (**Donàcia, Cryptocéphalus, Pachýbrachys, Callígrapha, Criócerus** [*C. aspáragi*, Asparagus-beetle], **Galerucélla** [*G. lutèola*, Imported elm-leaf beetle], **Diabrótica** [Corn root-worms], **Hàltica** [Flea-beetles], **Épitrix** [Flea-beetles] **Chálepus** (=*Odontòta*), [*C. dorsàlis*, Locust leaf-miner], **Leptinotársa** (=*Dorýphora*) [*L. decemlineàta*, Colorado potato-beetle]) (Pl. 5, fig. 104; Pl. 7, fig. 157)...................................CHRYSOMÉLIDÆ

110\. Rostrum extremely short and broad, scarcely developed; antennæ short, with a broad club; tibiæ often with several teeth externally; small, oval or cylindrical beetles of uniform brownish or blackish color..................111

Rostrum of variable length, but always distinctly developed and usually long; antennæ with a less pronounced club or not clubbed; tibiæ without a *series of teeth externally*......................................112

111\. First joint of the tarsi as long as the others united; head broader than the prothorax; eyes rounded. (**Plátypus**) (Pl. 6, fig. 116; Pl. 7, fig. 156).
PLATYPÓDIDÆ

First joint of the tarsi much shorter than the combined length of the others; head narrower than the prothorax; eyes oval, emarginate or divided. Bark-beetles. (**Ìps** (=Tomìcus), **Eccoptogáster** [*E. rugulòsus*, Shot-hole borer; *E. multistriàtus*, Imported elm bark-beetle], **Dendróctonus** [Pine and Spruce bark-beetles], **Xyléborus** [Timber-beetles], **Monárthrum**) (Pl. 6, figs. 112, 122; Pl. 7, figs. 154, 155, 162)................(*SCOLŸTIDÆ*) ÍPIDÆ

112\. Antennæ not elbowed; palpi usually exposed.........................113

Antennæ almost always elbowed, with the basal joint much elongated; palpi

small, nearly always concealed within the mouth, short and rigid; snout strongly curved downwards, especially when long. Weevils. (**Otiorhýnchus** (= *Brachyrhìnus*) [*O. ovàtus*, Strawberry root-weevil], **Phytónomus** [*Clover* and alfalfa weevils], **Pissòdes** [*P. stròbi*, White-pine weevil], **Anthónomus** [*A. grándis*, Mexican cotton-boll weevil; *A. quadrigíbbus*, Apple curculio], **Conotráchelus** [*C. nénuphar*, Plum curculio], **Cryptorhýnchus** [*C. lápathi*, Willow and poplar weevil], **Balanìnus** [Nut weevils], **Sphenóphorus** [Corn bill-bugs], **Calándra** [*C. granària*, Granary weevil]) (Including *RHINOMACÉRIDÆ, RHINCHÍTIDÆ, ATTELÀBIDÆ, BRYSÒPIDÆ, OTIORHÝNCHIDÆ* (= *BRACHYRHÍNIDÆ*), *CALÁNDRIDÆ*) (Pl. 5, fig. 106; Pl. 6, fig. 125; Pl. 7, fig. 153) .... **CURCULIÓNIDÆ**

113. Prothorax elongate, elytra covering the pygidium, first two ventral segments fused; rostrum short and broad. (**Cratóparis, Brachytársus**) **ANTHRÍBIDÆ**
Prothorax not elongate, usually trapezoidal; pygidium exposed; ventral segments free, rostrum very long in the female, sometimes entirely absent in the male. (**Eùpsalis, Brénthus, Cŷlas**) (*Pl. 6, fig. 115*) ...... **BRÉNTHIDÆ**

114. Lamellæ of antennal club not capable of closing together, usually not flattened, but forming a more or less comb-like mass 115
Lamellæ of antennal club flattened and capable of close apposition 117

115. Mentum entire, the ligula behind, or at the apex of the mentum 116
Mentum deeply emarginate, the ligula large, corneous, filling the emargination; large, elongate, shining beetles with deeply lined elytra. (**Pássalus**) **PASSÁLIDÆ**

116. Ligula and màxillæ covered by the mentum; antennæ usually elbowed. Stag-beetles. (**Lucànus, Dórcus, Platýcerus, Cerùchus**) (Pl. 7, fig. 149). **LUCÁNIDÆ**
Ligula and maxillæ not covered; antennæ straight. (**Sinodéndron.**) **SINODÉNDRIDÆ**

117. Side pieces of the mesosternum not attaining the coxæ; elytra with more or less distinct rows of tubercles; rather small or moderate-sized beetles. (**Tròx.**) .... **TRÒGIDÆ**
Side pieces of the mesosternum attaining the coxæ; moderate-sized, or large, stout-bodied, usually very convex beetles, with stout front legs, usually formed for digging. (**Onthóphagus, Cánthon** [Tumble-bug], **Aphòdius, Geotrùpes, Macrodáctylus** [Rose Chafer], **Lachnostérna** [June-bug], **Pelidnòta**) (Pl. 5, fig. 107; Pl. 7, figs. 150, 151) .... **SCARABÆIDÆ**

ORDER STREPSIPTERA.

(*RHIPIPTERA.*)

Small species parasitic on insects, the adult males winged and free-living, but the larviform females never leaving the body of their host. Male with the head free, with well-developed eyes; antennæ with three to seven joints, some of the joints prolonged into a long lateral process (flabellum); prothorax greatly reduced,

metathorax very large; fore wings reduced to small club-like balancers; hind wings large, very delicate, with a few fine radiating veins. Female with the mouth-parts and antennæ vestigial; head and thorax fused into one piece, sexual openings in the form of segmental usually unpaired canals opening on several of the abdominal segments.

1. Wingless, larviform, never leaving the host (Females)....................2
   Winged, free living insects (Males)....................4
2. Spiracles more or less easily discernible, generally prominent; four or five genital tubes entering the brood canal; parasitic on bees, wasps and ants. (**Stӯlops, Xènos**) (Pl. 8, figs. 169, 172)....................**XÉNIDÆ**
   Spiracles not usually discernible, never prominent....................3
3. Tubercles of head apical; parasitic on Homoptera. (**Agalliöphagus, Anthericómma.**)....................**HALICTOPHÁGIDÆ**
   Tubercles of head more or less obsolete, ventral; only three genital tubes entering the brood canal; parasitic on Homoptera (Fulgoroidea). (**Mecynócera, Pentagrammâphila.**)....................**ELÉNCHIDÆ**
4. Tarsi five-jointed, with two claws; antennæ seven-jointed, the third and fourth joints produced laterally into long flabella; hosts unknown. (**Trioxócera** (Mexico))....................**MENGÈIDÆ**
   Tarsi with four joints or less, without claws....................5
5. Tarsi four-jointed; antennæ with only the third joint flabellate. (Pl. 8, figs. 171, 175)....................**XÉNIDÆ**
   Tarsi three-jointed; antennæ with the third or the third to sixth joints flabellate. (Pl. 8, fig. 170)....................**HALICTOPHÁGIDÆ**
   Tarsi two-jointed; antennæ with only the third joint flabellate....**ELÉNCHIDÆ**

ORDER EMBIIDINA.

(*EMBIOIDEA, EMBIOPTERA, OLIGONEURA.*)

Elongate feeble insects scarcely half an inch in length, occurring in or near the tropics. Two pairs of similar wings superimposed over the abdomen, or wingless; a pair of short anal cerci; first joint of the front tarsi swollen and fitted for spinning delicate tubular webs.

1. Last dorsal plate of the abdomen not divided, nearly symmetrical, without processes; first joint of left cercus simple, usually cylindrical; neuration complete. (**Olӯntha**) (Pl. 8, fig. 174)....................**OLӮNTHIDÆ**
   Supraanal plate asymmetrical, deeply excised or divided, with processes........2
2. Cerci slightly asymmetrical, first joint of left cercus simple, cylindrical, straight or slightly curved or even clubbed, always without teeth on the inner side; neuration strongly reduced. Posterior branch of the radial vein not forked

in either wing, media and cubitus much reduced and usually indistinct. (**Oligótoma.**) .... OLIGOTÓMIDÆ

Cerci strongly asymmetrical, first joint of left cercus variously deformed, usually dentate within; neuration usually complete. (**Anisémbia**) (Pl. 8, fig. 173). EMBÌIDÆ

ORDER ODONATA.

(*LIBELLULOIDEA, PARANEUROPTERA.*)

Slender predatory insects, usually of large size and usually strong fliers; head mobile, eyes large, three ocelli; antennæ minute, mouth inferior, mandibles strong; prothorax small but free, meso- and metathorax fused, abdomen long and flexible, cerci one-jointed; legs not large, similar, placed far forward, tarsi three-jointed; wings four, nearly alike; elongate, membranous, net-veined, not folded, with characteristic nodus, arculus and triangle and with the radial sector crossing the anterior branch of the media. Metamorphosis considerable, the nymphs aquatic, no resting pupal stage.

1. Wings alike, held on edge over the abdomen in repose; eyes stalked. Damsel flies. (ZYGÓPTERA.) 2

   Wings somewhat dissimilar, horizontally out-spread in repose; eyes not pedunceled. Dragon flies. (ANISÓPTERA.) 3

2. At least five antecubital crossveins between the first and second veins before the nodus. (**Calópteryx, Hetærina**) .... CALOPTERÝGIDÆ

   Only two antecubital crossveins. (**Léstes, Enallàgma**) (*CŒNAGRIÔNIDÆ*) .... AGRIÓNIDÆ

3. Antecubital crossveins of first and second series not meeting except at base of wing. (**Ànax, Æschna, Gómphus, Cordulegâster**) (Including *GÔMPHIDÆ CORDULEGÂSTRIDÆ* .... ÆSCHNIDÆ

   Antecubital crossveins of first series meeting those of the second. (**Libéllula, Dìplax, Cordùlia**) (Pl. 8, figs. 176, 178) (Including *CORDULÌIDÆ*) LIBELLÙLIDÆ

ORDER PLECTOPTERA.

(*EPHEMEROPTERA, EPHEMEROIDEA, AGNATHA, EPHEMERIDA.*)

Delicate insects with short antennæ and rudimentary mouth. Hind wings generally present and much smaller than the forewings. Two or three long caudal filaments present. Nymphs aquatic, gill-bearing, suddenly changing to the adult. Adults short lived, but molting before sexual maturity. May flies or Sand-flies.

(**Hexagènia, Bætis, Heptagènia**) (Pl. 8, figs. 181, 183) .... EPHEMÉRIDÆ

ORDER PLECOPTERA.

(*PERLARIA.*)

Body soft, of moderate to large size; four membranous wings, usually with many veins, anal area of hind wings large and pleated, rarely with the wings greatly reduced in size; antennæ long, thread-like. Larvæ aquatic, metamorphosis slight. Stoneflies, Salmon-flies.

(**Pteronárcys, Pérla, Chloropérla, Nemoùra**) (Pl. 8, figs. 180, 182).
PÉRLIDÆ

ORDER MEGALOPTERA.

Soft-bodied species with large wings, long and sometimes pectinate antennæ and simple similar legs. Costal cell with many transverse veins, subcosta and radius simple, the radial sector arising near the base, anal space of hind wings large, folded fan-like when at rest; prothorax quadrate. Larvæ aquatic, predatory, with lateral abdominal gill-filaments; wings appearing during the resting nymphal stage.

Accessory veins at the end of the radial sector extending anteriorly; ocelli wanting; fourth tarsal joint prominently lobed on each side. (**Sìalis.**)
SIALÍDIDÆ

Accessory veins of the radial sector extending posteriorly; three ocelli present; fourth tarsal joint scarcely bilobed. (**Corýdalis** [*C. cornùta*, Dobson, Hellgrammite], **Chauliòdes**) (Pl. 8, figs. 179, 186)............**CORYDÁLIDÆ**

ORDER RAPHIDIOIDEA.

(*EMMENOGNATHA*, part)

Moderate-sized, slender, predatory species with elongate cylindrical prothorax; head large, nearly horizontal, mandibles strong, antennæ long and thread-like; wings membranous; both pairs similar, with numerous forkings, the costal cell with crossveins; legs similar, the first pair attached at base of prothorax, tarsi five-jointed; cerci not developed. Metamorphosis complete.

(**Raphídia, Inocéllia**) (Pl. 8, fig. 185.)..................**RAPHIDÌIDÆ**

ORDER NEUROPTERA.

(*MEGALOPTERA, SYNISTATA* (part), *DICTYOPTERA* (part)).

Small to rather large, slender, predaceous insects with large wings but of slow flight. Head free, vertical, eyes prominent, mouth inferior, mandibles strong; prothorax more or less free and prominent, meso- and metathorax not closely grown together; abdomen long and narrow, no cerci; wings similar, membranous, no large anal field, when at rest the wings lie roof-like over the abdomen, longitudinal veins almost always very numerous, costal cell almost always with cross-veins. Metamorphosis complete, larvæ terrestrial.

1. Front legs formed for seizing prey. (**Mantíspa, Sýmphasis**) (Pl. 8, figs. 177, 188, 189) .... MANTÍSPIDÆ
   Front legs not raptorial 2
2. Veins and usually crossveins abundant 3
   Veins and crossveins few in number, wings covered with a whitish powder; small rare species. (**Coniópteryx, Malacomýza**) .... CONIOPTERÝGIDÆ
3. Antennæ clubbed; wings with a network of veins, the subcosta and radius apically fused 4
   Antennæ not clubbed 5
4. Antennæ more than half as long as the wings. (**Ululòdes, Colobópterus.**) ASCALÁPHIDÆ
   Antennæ not one-third as long as the wings. Ant lions. (**Myrmèleon, Dendròleon, Brachynemùrus.**) .... MYRMELEÓNIDÆ
5. Antennæ thread-like; no recurrent vein, subcosta not fused with radius. Lace-wing fly or Aphis lion. (**Chrysòpa, Meleòma.**) .... CHRYSÓPIDÆ
   Antennæ like a string of beads (moniliform) or comb-like (pectinate) 6
6. Ocelli absent; female with ovipositor; antennæ of male pectinate. (**Dìlar**) (Pl. 8, fig. 184) .... DILÁRIDÆ
   Ocelli present; no ovipositor; antennæ moniliform 7
7. Subcosta fused with radius toward end of wing, wings with almost no crossveins except a graduated series, forming an oblique row of steps across the wing .. 8
   Subcosta and radius separate, although approximate, recurrent vein present or absent. (**Hemeròbius, Boriomýia, Sympheròbius, Mìcromus.**) HEMEROBÌIDÆ
8. A distinct recurrent vein at base of fore wing, crossveins (except costals) without bristles; cubitus of fore wings forked near base, media forked at about one-third its length; body rather stout. (**Polystœchotes**) POLYSTŒCHÓTIDÆ
   No recurrent vein 9

9. Wings acute at apex; outer margin of fore wings distinctly emarginate, crossveins with bristles; hind wings with a fork to the cubitus that extends very close to the hind margin. (Lomamyia) .... BERÓTHIDÆ
   Outer margin of fore wing not emarginate, crossveins not bristly. (Sisyra, Climàcia) .... SISÝRIDÆ

ORDER PANORPATÆ.

(*MECOPTERA.*)

Small to moderate-sized predatory insects with the head drawn out to form a sort of beak; wings when present long, narrow and similar, crossveins and veins moderately numerous; mandibles small, antennæ long and hair-like; prothorax small; legs long, similar, fitted for running; coxæ large, pendant and approximate, tarsi five-jointed; abdomen usually slender, cerci small, ninth segment of male greatly swollen and reflexed. Metamorphosis complete, larvæ resembling caterpillars. Scorpion flies.

1. Three ocelli present; winged species, costal margin without crossveins 2
   Ocelli absent 3
2. Tarsi with two claws; cubitus of fore wings forked near the base. Scorpion-flies. (Panórpa) (Pl. 9, figs. 190, 191, 192, 194) .... PANÓRPIDÆ
   Tarsi with a single claw; cubitus simple. (Bíttacus) (Pl. 9, fig. 193). BITTACÚSIDÆ
3. Wings well developed, costal cell with many crossveins. (Meròpe.) MERÓPIDÆ
   Wingless, or with very short wings. (Borèus) BORÈIDÆ

ORDER TRICHOPTERA.

(*PHRYGANOIDEA.*)

Small to medium-sized, slender, flying insects; head movable, vertical, eyes prominent, ocelli three or none, mandibles vestigial, palpi prominent, antennæ thread-like, often very long; prothorax small; wings more or less clothed with hairs, with many veins and a few crossveins, the hind wings with a folded anal area; legs similar, coxæ pendant and approximate, tarsi five-jointed. Metamorphosis complete, larvæ aquatic case-bearers. Caddice flies.

1. Minute, often pretty, moth-like pubescent species, whose anterior wings are closely covered with projecting, clubbed hairs; marginal fringe of wings very long, that of hind wings longer; discal cell of hind wings open or wanting; wings usually very long and narrow, more or less pointed; antennæ at most as long as the fore wings, usually much shorter and usually thickened;

maxillary palpi of both sexes five-jointed, strongly hairy, their last joint neither bowed nor ringed; ocelli usually present. (**Hydróptila.**) **HYDROPTÍLIDÆ**

Rarely minute species; fore wings without or with solitary thickened projecting hairs; marginal fringe shorter than width of wing; antennæ almost always longer than the fore wings....................2

2. Ocelli present; maxillary palpi with only weak hairs....................3

Ocelli absent....................6

3. Last joint of maxillary palpi divided into false ring-joints, curved and as long as the third and fourth joints together; front tibiæ with no, two, or three spurs. (*THYACOPHÍLIDÆ* and *HYDROPSÝCHIDÆ*, part; Banks, 1907). (**Philopótamus.**)....................**PHILOPOTÁMIDÆ**

Last joint of maxillary palpi not ringed, rarely curved, subequal to the other joints....................4

4. Front tibiæ with one or no spur; middle tibiæ with three or two spurs; maxillary palpi of male three-jointed, of female five-jointed, but of similar structure in the two sexes. (**Anabòlia, Limnéphilus.**) (Pl. 9, figs. 195, 196). **LIMNEPHÍLIDÆ**

Front tibiæ with two or three spurs, posterior tibiæ with four spurs; maxillary palpi four- or five-jointed....................5

5. Maxillary palpi five-jointed, the basal two joints very short (**Rhyacóphila**) **RHYACOPHÍLIDÆ**

Maxillary palpi of male four-jointed, of female five-jointed, the joints cylindrical, the second joint not short, the palpi of the two sexes similar. (**Neurònia, Phrygânea.**)....................**PHRYGANÈIDÆ**

6. Tibial spurs 3:4:4; maxillary palpi weakly hairy, five-jointed, the first and second joints very small, the last joint ringed and curved; antennæ thickened. (*HYDROPSÝCHIDÆ*, part; Banks, 1907.) (**Polycéntropus.**) **POLYCENTROPÓDIDÆ**

Usually two, never three, spurs on front tibiæ....................7

7. Last joint of the five-jointed, scarcely hairy, maxillary palpi annulate and arcuate....................8

Last joint of the usually strongly hairy maxillary palpi neither ringed nor curved....................9

8. First vein from the discal cell of the fore wing forked; maxillary palpi long and thin. (**Hydropsỳche, Macronèma**) (Pl. 9, fig. 197)...**HYDROPSỲCHIDÆ**

First fork wanting in both fore and hind wings; first joint of the maxillary palpi small. (*HYDROPSỲCHIDÆ*, part; Banks, 1907) (**Psychomỳia**). **PSYCHOMYÌIDÆ**

9. Both median and discal cells of fore wings present and closed; maxillary palpi five-jointed. (**Heteroplèctron.**)....................**CALAMOCERÓTIDÆ**

Median cell of fore wings absent....................10

10. Maxillary palpi of the male three-jointed, of the female five-jointed, of different structure in the two sexes; antennæ usually thick, hairy and with large basal joint; wings thickly hairy, discal cell present. (**Brachycéntrus.**) **SERICOSTOMÁTIDÆ**

Maxillary palpi of both sexes five-jointed....................11

11. Discal cell of both wings absent, neuration of the two sexes usually different, apical veins few. (*LEPTOCÉRIDÆ* part; Banks, 1907) (**Molánna**). **MOLÁNNIDÆ**
    Discal cell of fore wings present....................................12
12. Middle tibiæ with two spurs; discal cell of hind wings almost always open or absent, only the upper branch of the radial sector forked, only the first apical fork present; joints of maxillary palpi uniform; antennæ long and slender. (**Leptócerus**)....................**LEPTOCÉRIDÆ**
    Middle tibiæ usually with four spurs; discal cell of hind wings closed, both branches of radial sector of fore wings forked, at least the first and second apical forks present; basal joint of antennæ large. (**Nerόphilus.**) **ODONTOCÉRIDÆ**

ORDER LEPIDOPTERA.

(*PSYCHE, GLOSSATA.*)

Rather large, sometimes small or very large insects; wings and body thickly clothed with scales that form a color pattern, these rarely restricted to certain portions or absent in a very few unusual forms; antennae long, many-jointed, variously modified; ocelli sometimes present; mouthparts suctorial, when not in use coiled under the head, the mandibles incorporated into an unjointed tongue, which may be occasionally wanting; prothorax small; wings large, membranous, similar, the fore pair somewhat longer; venation complete, but not complex, few crossveins; legs similar, tarsi ordinarily five-jointed; no cerci. Metamorphosis very great; larvæ with biting mouth-parts, usually caterpillar-like, and with paired false-legs on some of the abdominal segments in addition to three thoracic pairs; larvæ almost without exception plant-feeders. Moths, Butterflies and Skippers.

1. Antennæ simple or variously modified (Pl. 10, figs. 216, 224, 229), only rarely swollen at the tip, and in such cases a frenulum is present; most forms with a frenulum, the subcosta of the hind wing either but little arched at the base or there is a large area between it and the fore margin of the wing; wings at rest overlapping the abdomen or horizontally outspread; body often relatively stout. Moths. (HETERÓCERA.) 2
   Antennæ knobbed at the tip or thickened a little before the tip (Pl. 10, figs. 219, 220, 237), without pectiuations, projecting processes or conspicuous arrangements of hairs; hind wings without a frenulum, but with the subcosta strongly arched forward at the base; at least the fore wings erect when at rest. Butterflies and Skippers. (RHOPALÓCERA, PAPILIONOÍDEA.)....................97

2. Winged..3
Wingless..55

3. Hind wings with four or five radial veins (Pl. 9, fig. 199), with at least ten veins besides anals, more than six veins arising from the discal cell; wings of similar shape, the membrane with minute spines (Pl. 9, fig. 200); forewing with a jugum. (JUGÀTÆ, MICROPTERYGOÍDEA.)....................4
Hind wings with only one free radial vein (Pl. 9, fig. 202) (very rarely two); with at most six veins arising from the discal cell; fore and hind wings dissimilar in shape, the frenulum very often present. (FRENÀTÆ.)......5

4. Wings hardly wider than their fringe; expanse about half an inch; tibial spurs present. **(Eriocèphala, Epimartỳria)** (Pl. 9, fig. 199) **ERIOCEPHÁLIDÆ**
Wings ample, fringe narrow; expanse over one inch; tibial spurs wanting. **(Sthenòpis, Hepìalus.)**.................. **HEPIÁLIDÆ**

5. Wings entire, not cleft nor divided into finger-shaped divisions, rarely the fore wings moderately cleft....................6
Wings, especially the hind ones deeply cleft, or divided into plume-like divisions (Pl. 9, figs. 203, 204). Feather-wing moths....................7

6. Inner margin of fore wing and costal margin of hind wing narrowly folded and interlocking; fore wings at least four times as long as wide; at least the base of the hind wing, and usually a great part of the wings, hyaline; brightly colored, diurnal moths. (**Melíttia** [*M. satyriniformis*, Squash-borer], **Sèsia** [*S. tipuliformis*, Currant-borer; *S. rutilans*, Strawberry crown-moth], **Bembècia** [*B. marginata*, Blackberry crown-borer], **Sanninoídea** [*S. exitiosa*, Peach-borer]) (Pl. 10., figs. 221, 229, 232). (*ÆGERÌIDÆ.*) ...**SESÌIDÆ**
Wings not interlocking at middle of margin, very rarely transparent, and if so, with broader fore wings....................8

7. Fore wings divided into two plumes, hind wings into three; small, delicate moths, usually prettily colored. **(Oxýptilus, Platyptília, Pteróphorus)** (Pl. 9, fig. 203; Pl. 10, figs. 225, 231).................. **PTEROPHÓRIDÆ**
Each wing divided into six plumes; a small silvery white moth. **(Orneòdes)** (Pl. 9, fig. 204).................. **ORNEÓDIDÆ**

8. Hind wings much broader than their fringe, never spear-shaped, and rarely trapezoidal with produced apex....................9
Hind wings tapering toward base and apex, without marked anal angle, or notched below the apex and trapezoidal; the fringe wider, or almost as wide, as the wing....................58

9. Underside of hind wing with a double series of enlarged and divergent scales along the cubital vein...............Agdistìnæ of the **PTEROPHÓRIDÆ**
No such specialized scales....................10

10. Fore wings with two anal veins attaining the margin (Pl. 9, fig. 205)........11
Fore wings with only one anal vein attaining the margin, the first anal vestigial or represented by a fold and the third at most by a short spur (Pl. 9, fig. 202)....................20

11. Antennæ plainly knobbed; hind wing with a large præcostal area; large showy moths of butterfly- or skipper-like appearance. **(Cástnia.)**..**CASTNÌIDÆ**
Antennæ tapering to tip....................12

12\. Subcosta and radius of hind wing independent, parallel or arising separately; connected by a crossvein or rarely fused beyond the cell 13
Subcosta of hind wing, arising from the cell (Pl. 9, fig. 205) 18

13\. Subcosta and radius of hind wing connected by a strong crossvein near the middle of the cell or beyond (Pl. 9, fig. 211), independent and parallel... 14
Subcosta and radius of hind wing of a different conformation 17

14\. Fore wing with an accessory cell (Pl. 9, fig. 211) 15
No accessory cell 16

15\. Wings bluntly pointed toward tips, strong; body heavy, far exceeding the hind wings when spread; palpi vestigial; usually large moths. (**Prionoxýstus** [*P. robiniæ*, Carpenter-moth] **Zeuzèra** [*Z. pyrina*, Leopard-moth] **Cóssus**) (Pl. 9, fig. 211) .... **CÓSSIDÆ**
Wings broad, rather short and rounded, body short and slender, not exceeding the hind wings; palpi well developed; moderate-sized moths, with hairy body and usually of yellow or orange color. (**Dalcérides.**) .. **DALCÉRIDÆ**

16\. Tongue developed; palpi and wings scaled; moderately large moths with conspicuous color pattern. (**Gíngla.**) .... **CHALCOSÌIDÆ**
Tongue absent; palpi small and hairy, or absent; wings hairy, but nearly destitute of scales; females wingless. Bag-worms. (**Thyridópteryx** [*T. ephemeræformis*, Bag-worm], **Solenòbia, Chàlia.**) .... **PSÝCHIDÆ**

17\. Subcosta arising separately from the radius, running closely parallel to it to well beyond the end of the cell; base of the radius in that case either complete, showing as a short spur, or lost; small, rarely moderate-sized moths **Diaphània** [*D.(=Margaronia) nitidalis*, Pickle-moth], **Loxóstege** [*L. similalis*, Garden webworm], **Pyrausta, Pyràlis** [*P. farinalis*, Meal snout-moth], **Crámbus** [Root webworms], **Gallèria** [*G. mellonella*, Bee-moth], **Mineòla** [*M. indigenella*, Leaf-crumpler], **Ephéstia** [*E. kuehniella*, Mediterranean flour-moth], **Plòdia** [*P. interpunctella*, Indian meal-moth]) (Including *PYRAUSTIDÆ, GALLERIIDÆ, CRAMBIDÆ, PHYCITIDÆ.*) (Pl. 10, figs. 223, 230) .... **PYRALÍDIDÆ**
Subcosta entirely independent of the radius, or connected by a weak crossvein, or one near the base of the wing, sharply divergent before the end of the cell 58

18\. Subcosta arising from near the middle of the cell; sometimes free also for a short distance near the base; moderately small, stout-bodied moths with rather small wings; larvæ slug-like. (**Euclêa, Tortricídia, Packárdia.**) (*EUCLÈIDÆ.*) .... **COCHLIDÌIDÆ**
Subcosta arising near the tip of the cell 19

19\. Fifth branch of the radius long-stalked; pale-colored moths of moderate size and inconspicuous appearance, with stout, hairy body and small, furry wings. (**Lagòa, Megalopýge.**) .... **MEGALOPÝGIDÆ**
Fifth branch of radius arising from the cell; small, dark, often brightly marked moths with smoothly scaled wings. (**Acolòithus, Tríprocris, Harrisìna.**) (Pl. 9, fig. 205) .... **PYROMÓRPHIIDÆ**

20. Hind wings with three anal veins, the first often fading out toward base. . 21
Hind wing with two anal veins or less, at most with a short spur of the first anal at the margin in the broad-winged forms 22

21. Subcosta and radius in hind wings closely parallel, or fused beyond the end of the cell; small, rarely moderate-sized moths (see couplet 17).
PYRALÍDIDÆ, part
Subcosta and radius strongly divergent from before the end of the cell. . . . 58

22. Large stout moths, almost always two inches or more in expanse, the hind wings rarely reaching beyond the middle of the abdomen; subcosta and radius of hind wing connected by a stong crossvein at, or rather before the middle of the cell, then closely parallel to the end of the cell or beyond; antennæ generally thickened medially and often hooked or recurved at tip. Sphinx caterpillars; Hawk moths. (**Phlegethóntius, Sphínx, Phòlus, Deiléphila.**) . . . . SPHÍNGIDÆ
Wings proportionately larger, subcosta and radius rarely connected by a strong crossvein, and if so, strongly divergent beyond it; antennæ very rarely swollen apically 23

23. Accessory cell (a small cell in front of the end of the discal cell) separated by a full-sized vein, or completely absent 24
Accessory cell fused with the discal cell, but with a slight thickening at the line of separation; small species, less than one inch in expanse 58

24. Cubitus of fore wings apparently three-branched (very rarely two-branched). 25
Cubitus of fore wings apparently four-branched 40

25. Frenulum normal, well-developed 26
Frenulum vestigial or absent, always less than one-fifteenth the length of the hind wings 33

26. Subcosta and radius in hind wing sharply divergent from near the base; small, delicate moths with large wings. (**Callízzia, Calledápteryx.**)
EPIPLÉMIDÆ
Subcosta and radius in hind wing fused or approximated for at least part of their course (Pl. 10, fig. 228) 27

27. Subcosta and radius in hind wing separate at extreme base, then close together or fused for a greater or less distance 28
Subcosta and radius fused from base to beyond middle of hind wing, swollen at the base then rapidly diverging, very slender; rather small moths, usually of dull colors and with finely scaled wings, the fore pair narrow and the hind pair broad (see couplet 54) . . . . LITHOSÌIDÆ, part

28. Stout-bodied moths, the width of the thorax at least one-sixth the length of the fore wing 29
Slender moths 32

29. Subcosta moderately thickened and curved at the base 30
A strong brace-vein from an angle near the base of the subcosta to the root of the frenulum (see couplet 32) . . . . GEOMÉTRIDÆ, part

30. Cubitus in hind wing apparently three-branched 31
Cubitus in hind wing apparently four-branched; medium-sized moths with

elongated wings, the fore pair often widened at the basal angle. (**Euthyatìra, Habrosy̆ne**). *CYMATOPHÒRIDÆ*...............THYATÍRIDÆ

31. Tongue entirely absent; wings usually with clear spots before apex. (**Apatelòdes.**)....................................EUPTERÓTIDÆ

Tongue distinct, usually well-developed; wings fully scaled; moths of moderate size and inconspicuous colors, the body rather stout and densely hairy; hind tibiæ with two pairs of stout spurs. "Prominents." (**Datâna** [*D. ministra*, Yellow-neck caterpillar] **Heterocâmpa**, **Schizùra** [*S.* (=*Œdemasia*) *concinna*, Red-hump Apple-caterpillar]) (Pl. 10, fig. 228) NOTODÓNTIDÆ

32. Spiracles (tympanic openings) at base of abdomen small and subdorsal; first anal vein usually partly present; subcosta in hind wing slightly bent at the base and but little enlarged, the humeral angle not expanded; last branch of media and first branch of cubitus stalked in the fore wing; brightly colored moths, usually with hyaline spots on the wings. (**Phryganídia.**) DIÓPTIDÆ

Tympanic opening almost always conspicuous and swollen, lateral; first anal vein absent in both wings; subcosta of hind wing sharply bent or much enlarged at the base, almost always with a brace-vein extending to the base of the frenulum; usually small or moderate sized moths of delicate form, with large, finely-scaled wings. (**Paleácrita** [*P. vernata*, Spring canker-worm], **Alsóphila** [*A. pometaria*, Fall canker-worm], **Tephrocly̆stis**, **Rheumâptera**, **Hydriómena**, **Petróphora**, **Eòis**, **Sciagrâphia**, **Cymatóphora** [*C. ribearia*, Currant span-worm].)........................ GEOMÉTRIDÆ

33. Subcosta and radius in hind wings either fused for a very short distance, then sharply divergent, or separate from the base, or connected by a weak crossvein; spiracles at base of abdomen inconspicuous....................34

Subcosta sharply divergent from the radius at the extreme base, then sharply bent and touching, fusing with, or closely parallel to it, or connected by a strong crossvein; spiracles at base of abdomen conspicuous, lateral (see couplet 32) ....A few GEOMÉTRIDÆ

34. Antennæ not scaled beyond the basal joint. (SATURNOÍDEA.).........35

Antennæ closely scaled on the upper side..............................36

35. Two anal veins; first branch of media in fore wings fused or stalked with the radial stem; medium-sized or large moths with stout, hairy bodies and strong wings. (**Anisòta, Citherònia, Basilòna.** (*CERATOCÂMPIDÆ*) CITHERONÌIDÆ

First branch of media separate from the radial stem; with only one anal vein, or else the upper discocellular vein (the crossvein at the end of the discal cell, between the last radial and the media) long and longitudinal; moderate, large or gigantic moths, with broad and usually strikingly colored wings. (**Sâmia** [*S. cecropia*, Cecropia moth], **Callosâmia** [*C. promethia*, Promethia moth], **Tropœa** [*T. luna*, Luna moth], **Tèlea** [*T. polyphemus*, Polyphèmus moth], **Autómeris** [*A. io*, Io moth].).....................SATURNÌIDÆ

36. Subcosta of hind wing sharply divergent from the radius from close to its base 37

Subcosta and radius parallel at base, connected by a weak crossvein......39

37. Fourth and fifth branches of the radius stalked, widely separate from the third branch; moderate sized, rather stout-bodied, hairy moths, with the wings often notched or concave behind. (**Cicínnus, Lacosòma.**)
LACOSOMÁTIDÆ

Fourth and fifth branches of the radius arising from the discal cell closely associated with the third branch.................................38

38. Fifth branch of the radius stalked with the first branch of the media, or closely approximate at base and separate from the fourth branch of the radius.
URANÌIDÆ

Fourth and fifth branches of the radius separate, the fourth sometimes stalked with the third.......................................LONOMÌIDÆ

39. Frenulum about one-sixteenth the length of the hind wing.
EUPTEROTÌNÆ of the EUPTERÓTIDÆ

Frenulum absent, or at most not exceeding the front basal angle of the wing. (*Bómbyx mòri*, the silkworm.)........................BOMBÝCIDÆ

40. Second cubital vein in the fore wing arising from the cell about a third-way out from the base, or even nearer the base; last radial vein stalked with the first medial; frenulum absent, the basal front angle of the hind wing expanded and furnished with a couple of short extra veins; stout-bodied moths of medium or rather large size. (**Malacosòma** (=*Clisiocampa*) [*M. americanum*, Apple tent-caterpillar; *M. disstria*, Forest tent-caterpillar], **Tólype.**)..LASIOCÁMPIDÆ

Second cubital vein of fore wing arising well beyond the middle of the cell; frenulum usually present..41

41. Subcosta and radius in hind wing strong and parallel to beyond the end of the cell, then approaching very close or fusing for a short distance; small or moderate-sized moths of slender form, the tip of the fore wing usually curving back. (**Drepâna, Orêta**) (Including *PLATYPTERYGIDÆ*, *AUZATIDÆ*).......................................DREPÁNIDÆ

Subcosta and radius fusing before end of cell; or wholly independent......42

42. Fore wing with complete venation (twelve veins), all of the radials, medials and cubitals arising separately or with the second and third radials short-stalked; small moths of slender build, usually with pale, translucent spots on the wings. (**Thýris, Dysòdia.**).....................THYRÍDIDÆ

Third and fourth radial veins, or the fourth and fifth long-stalked, or else with some veins absent..43

43. Subcosta apparently absent, fused with the radius except at the extreme base; rather small or medium-sized moths, often brightly colored, the wings small, especially the hind pair. (**Scépsis, Ctenùcha**) (*ZYGÆNIDÆ* of some authors)...SYNTÓMIDÆ

Subcosta and radius separating before the end of the cell................44

44. Antennæ swollen or enlarged toward tip; rather small or medium-sized moths of brilliant colors, often dark, ornamented with large pale spots. (**Alýpia** [*A. octomaculata*, Forester moth] **Androlòma**) (Pl. 10, fig. 227).
AGARÍSTIDÆ

Antennæ regularly tapering to apex......................................45

45. Ocelli present, on the vertex close to the eyes........................46
Ocelli absent 53

46. Subcosta and radius in hind wing connected by a strong crossvein..........47
Subcosta and radius in hind wing fused at least slightly and usually for some distance along the cell..48

47. Tongue absent (see couplet 54) (*LIPARIDÆ*).......**LYMANTRÌIDÆ**, part.
Tongue present; palpi reaching far above the vertex, the third joint naked; a species is said to occur in North America.................**HÍPSIDÆ**

48. Fusion of the subcosta and radius extending to the middle of the cell, or beyond; stout-bodied moths of moderate size, with the wings usually marked in bold design of contrasting colors. Tiger moths, Woolly-bear caterpillars. (**Utethèisa, Estigmène, Apantèsis, Halisidòta, Diacrísia** (= *Spilosoma*) [*D. virginica*, White ermine moth], **Hyphântria** [*H. cunea*, Fall web-worm].)..**ARCTÌIDÆ**
Fusion of subcosta and radius falling short of the middle of the cell........49

49. Fusion of subcosta and radius exceeding the basal fifth of the cell..........50
Fusion of subcosta and radius less than one-fifth the length of the cell, or imperfect... 51

50. Hind tarsus stout, not ordinarily over eight times as long as thick; tibial spurs often reduced; subcosta greatly swollen at base (see couplet 48).
ARCTÌIDÆ, part
Hind tarsus more slender; tibial spurs long; subcosta basally not more than twice as thick as the radius (see couplet 52)...........**NOCTÙIDÆ**, part

51. Swollen spiracles at base of abdomen (tympanic bullæ) enlarged dorsally, visible from above as two rounded elevations on the first abdominal segment; moderate, or rather large, gaily colored moths, often with metallic tints and bold markings. (**Gnophæla.**)................**PERICÓPIDÆ**
Tympanic bullæ inconspicuous....................................52

52. White or yellow moths with the palpi not reaching the middle of the smoothly scaled front; cubitus four-branched in both wings. (**Haplòa.**)
ARCTÌIDÆ, part
Palpi longer; cubitus in hind wing three-branched, or ground color of wings gray; stout moths, generally of sombre brown or gray color, the hind wings sometimes enlivened by large pale or colored patches; a very extensive family. Owlet Moths, Moths of cut-worms, army-worms, etc. (**Apatèla Hadèna, Prodènia, Laphýgma** [*L. frugiperda*, Fall army-worm], **Agròtis** [several common cut-worms], **Peridròma** [*P. saucia*, Variegated cut-worm], **Heliόphila** [*H. unipuncta*, Army-worm], **Xylina** [*X. antennata*, Green fruit-worm], **Papaipèma** [*P. nitela*, Stalk-borer], **Heliòthis** [*H. obsoleta*, Corn ear-worm and Cotton boll-worm], **Alabàma** (= *Aletia*) [*A. argillacea*, Cotton-worm], **Catocàla.**) (Pl. 9, fig. 202) (Including *NYCTEOLIDÆ*.)
NOCTÙIDÆ

53. Fore wing with raised tufts of scales; subcosta usually fused with the radius to near the middle of the cell, but free at base; small moths with rather narrow fore wings, and short, rounded hind wings. (**Celàma, Nòla.**) (Pl. 11, fig. 233.).. **NÓLIDÆ**
Fore wing without raised tufts of scales, smoothly scaled throughout.....**54**

54. Subcosta and radius in hind wing fused for a point about the middle of the cell, or connected by a crossvein; small or moderate-sized moths of dull, inconspicuous colors, the females of many species partly or entirely wingless. (**Hemerocámpa** (= *Notolophus, Orgyia*) [*H. leucostigma*, White-marked tussock moth], **Olêne, Porthêtria** (= *Ocneria, Lìparis*) [*P. dispar*, Gypsy moth], **Euproctis** [*E. chrysorrhœa*, Brown-tail moth]) (*LIPARIDÆ*). **LYMANTRÌIDÆ**

Subcosta and radius fused from the base to the middle of the cell; rather small moths, usually of dull colors, and with finely scaled wings, the fore pair narrow and the hind pair broad. (**Hypoprêpia, Crambídia**) (Pl. 10, fig. 226). **LITHOSÌIDÆ**, part

55. Legs absent, adults never leaving the cocoon; females. (See couplet 16). **PSÝCHIDÆ**, part

Legs normally developed 56

56. Cocoon seed-like, with a valve at one end (being formed of the larval case), the moth normally not leaving it; females (see couplet 16) . **PSÝCHIDÆ**, part

Cocoon normally felted, of the larval hair, or rudimentary and underground . 57

57. Abdomen closely scaled or spined, or with bristly, dark gray hair; a few females (see couplet 32) . . . . **GEOMÉTRIDÆ**, part

Abdomen smoothly clothed with fine, light, woolly hair; moth not normally leaving the cocoon, which is composed of the larval hair; a few females (see couplet 54) . . . . **LYMANTRÌIDÆ**, part

58. Fore wing with three or four unbranched veins only 59

Fore wing with some branched veins in addition to unbranched ones 60

59. A large eyecap present. (**Opóstega.**) . . . . **OPOSTÉGIDÆ**

No eyecap (see couplet 80) . . . . **HELIOZÉLIDÆ**, part

60. A well-developed eyecap, fringed with overlapping scales; labial palpi small; cell slender or absent 61

Eyecap not developed, at most with the first antennal joint large, a little hollowed on the inner side and fringed with a single row of bristles 62

61. Discal cell very small, less than a tenth of the area of the wing, or wholly absent; wing membrane prickly (Pl. 9, fig. 200) (**Neptícula, Ectœdêmia**). **NEPTICÙLIDÆ**

Discal cell larger; wing membrane not prickly. (**Proleucóptera, Phyllocnístis, Bucculâtrix**) . . . . **LYONETÌIDÆ**

62. Maxillary palpi twice as long as the eye, folded, conspicuous; living as larvæ in plants of the genus Yucca. Yucca Moths. (**Pronùba, Prodóxus.**) (Pl. 9, fig. 207.) . . . . **PRODÓXIDÆ**

Maxillary palpi shorter than the eye, or porrect 63

63. Palpi short, at most barely reaching the middle of the front; tongue absent; covering of thorax and tibiæ dense and hairy (see couplet 15). **CÓSSIDÆ**, part

Of a different conformation 64

64. Covering of thorax consisting of hairs, some of them broadened at tips, also similar on palpi and legs; palpi large and usually different in the two sexes,

wings scaled; venation complete, with the base of the media preserved. (Anáphora.) .... ANAPHORÌNÆ of the TINÈIDÆ

Thorax, at least, scaled or slender, palpi and front and middle tibiæ also in the majority of cases; often minute moths with wings tapering at both ends, 65

65. Hind wing with a well marked anal angle, and rounded or somewhat pointed apex, not strongly concave below it; when narrower than fore wings, with three well developed anals 76 81

Of a different conformation 66

66. Hind wing tapering toward both base and apex, much narrower than its own fringe, fore wing much broader, but also lanceolate 67

Hind wing of variable size with produced apex, strongly concave below apex, and again produced more or less on the third medial and first cubital, with well marked anal angle. (Gnorimóschema, Ypsólophus [*Y. ligulellus*, Palmer-worm], Sitotròga [*S. cerealella*, Angumois grain-moth], Phthormiæa [*P. operculella*, Potato-tuber moth], Gelèchia) (Pl. 9, fig. 209). GELECHÌIDÆ

67. Maxillary palpi present and folded in repose 68

Maxillary palpi obsolete, or three-jointed and porrect 70

68. Head extremely rough, with bristling vestiture 69

Head smoothly scaled, except narrowly behind. (Acrolèpia) ACROLEPÌIDÆ

69. Wing membrane prickly (Pl. 9, fig. 200), first branch of the radius in hind wing much stronger than the base of the main stem of the radius, and appearing as a basal fork of the subcosta (see couplet 82) .... ADÉLIDÆ, part

Wing membrane not prickly; first branch of radius in hind wing no stronger than the basal portion of the radial stem, well out from the base, connecting the subcosta and radius, which are closely parallel toward the base (see couplet 84) .... A few TINÈIDÆ

70. Head very rough and bristly on both vertex and face; second joint of palpus with lateral bristles toward tip. (Tenàga.) .... TINÈIDÆ, part

Lower part of face, at least, smoothly scaled; palpi without bristles 71

71. Fore wing with at most four veins, either free or stalked, to the costa from the cell; with five or six veins running to the inner margin (fifth branch of the radius running to the outer margin (see couplet 90). YPONOMEÙTIDÆ, part

Fore wing with five veins running to the costa from the cell, or with only three or four to the inner margin (fifth radial running to the costa) 72

72. Vertex rough-bristled 73

Vertex smooth-scaled, or with a few erect scales behind 75

73. Accessory cell (in front of and beyond the discal cell) very large, extending nearly halfway to the base of the wing; fore wing with heavy spinules on base of the subcosta and base of the cell. (Tischèria, Coptotrìche) (Pl. 9. fig. 212) .... TISCHERÌIDÆ

Accessory cell small, or more often absent; wing membrane not prickly 74

74. Anal vein in fore wing forked at the base; costa of hind wing not lobed. (Bedéllia.) .... LYONETÌIDÆ, part

Anal vein in fore wing simple; costa of hind wing strongly lobed, with the obscure basal parts of the subcosta and radius closely parallel to the edge of the lobe. (**Lithocollètes, Gracilària, Órnix.**)........**GRACILARÌIDÆ**

75. Subcosta and radius in hind wing nearly straight and parallel toward base, usually connected by a distinct, but weak crossvein; rarely, when subcosta is very short, this vein enters the costa beyond the tip of the subcosta; when the costa is lobed, with the subcosta fairly straight, and ending at the commencement of the concave portion..........................76

Subcosta and radius sharply divergent at base; first radial vein, when traceable, appearing as a basal fork of the subcosta, oblique, short and heavy, and the radial stem running nearly through the axis of the wing; or with the subcosta and radius both obscure, closely parallel to the basal lobe of the costa, and the radius functionally replaced by the base of the media........77

76. Palpi upturned to the vertex. (**Mómpha, Cosmópteryx, Coleóphora** [*C. malivorella*), Pistol case-bearer; *C. fletcherella*, Cigar case-bearer]) (Pl. 9, fig. 208).................................. **COSMOPTERÝGIDÆ**

Palpi minute, drooping. (**Heliodìnes.**)...................**HELIODÍNIDÆ**

77. Maxillary palpi present, porrect (see couplet 74).....**GRACILARÌIDÆ**, part

Maxillary palpi absent..78

78. Cubital stem in hind wing at least two-branched; palpi usually smoothly upturned to vertex; hind tibiæ loosely hairy. (**Elachísta.**)
ELACHÍSTIDÆ

Cubital stem in hind wing simple, free; no cell, or with very short palpi....79

79. Basal joint of antennæ broadened with overlapping scales (a vestige of an eyecap); tongue weak; cubitus in hind wing simple; hind tibiæ with a regular series of bristles. (**Phyllocnístis**, part) (see couplet 61) **LYONETÌIDÆ**, part

Basal joint of antennæ simple, or with a slight comb of bristles..........80

80. Palpi usually hanging, if upturned, not reaching the middle of the front. (**Heliozèla, Antispìla, Coptodísca, Cycloplàsis.**).........**HELIOZÉLIDÆ**

Palpi moderately long and usually slender, upturned in life (see couplet 74).
GRACILARÌIDÆ

81. Second branch of the cubitus in the fore wing arising less than two-thirds way out of the cell; rather or quite small moths, the fore wings frequently more or less truncate or faintly excised at the tip. Leaf-rollers. (**Olethreùtes, Eucósma, Spilonòta** (= *Tmetocera*) [*S. ocellana*, Bud-moth] **Ancỳlis** [*A. comptana*, Strawberry leaf-roller], **Enarmònia** [*E. prunivora*, Lesser apple-worm], **Carpocápsa** (= *Cydia*) [*C. pomonella*, Codling-moth], **Árchips, Tórtrix.**).............................. Most **TORTRÍCIDÆ**

Second cubital vein in fore wing arising further out of the cell............82

82. Wing membrane prickly; subcosta in hind wing with a strong basal fork, or considerably swollen at base; radius and subcosta usually sharply divergent from the base; antennæ often extremely long; vertex very rough. (**Incurvària, Adèla, Cyàne.**).............................**ADÉLIDÆ**, part

Wing membrane not prickly; antennæ never much longer than the fore wing; first radial rarely as strong as the other veins, and when distinct, separated from the base of the wing by several times its length...............83

83. Maxillary palpi four- or five-jointed, folded 84
Maxillary palpi three-jointed or vestigial, projecting 85

84. Head only slightly rough behind. (**Acrolèpia.**) .... **ACROLEPÌIDÆ**, part
Vertex with long, bristly vestiture. (**Tìnea** [*T. pellionella*, Clothes-moth], **Tinèola** [*T. bisselliella*, Clothes-moth], **Xylésthia, Setomórpha**) (Pl. 9, fig. 201) .... **TINÈIDÆ**

85. First and second branches of the media both absent in the hind wing. (**Carposìna.**) .... **TORTRÍCIDÆ**, part
First branch of the media present in the hind wing 86

86. Labial palpi with bristles on each side of the second joint, or the vertex and the front both with extremely long, rough vestiture, and the second joint of the palpi heavily tufted and the third long (see couplet 84).
TINÈIDÆ, part
Labial palpi without bristles; head with short, fairly smooth vestiture, or third joint of palpi inconspicuous 87

87. Radius and first medial vein in hind wing close together or stalked 88
Radius and first medial vein in hind wing widely separate at base, at least half as far apart as at margin 93

88. Palpi as long as the head, with the second joint triangularly scaled, third less than half as long; normally projecting 89
Palpi upturned to beyond middle of front, often far beyond vertex, third joint more than half as long as second and upturned 90

89. Fourth and fifth radial veins separate. (**Phalônia.**)
PHALONIÌNÆ of the **TORTRÍCIDÆ**
Fourth and fifth radial veins stalked, to costa. (**Anársia** ♂ [*A. lineatella*, Peach twig-borer].) .... **GELECHÌIDÆ**, part

90. Veins of fore wing all present; fifth radial vein running to outer margin; wings very frequently ornamented with series of dots contrasting with the ground color. (**Attèva, Yponomeùta, Choreùtis, Argyrésthia.**)
YPONOMEÙTIDÆ, part
Fifth branch of radius in fore wing running to the costa, or lost 91

91. Hind wing lanceolate (tapering toward base and apex) narrower than the fore wing (see couplet 76) .... **COSMOPTERÝGIDÆ**
Hind wing wider than the fore wing, not lanceolate 92

92. Fore wing with all veins from cell arising separately; radius and first medial vein in hind wing long-stalked. (**Stenôma, Brachilôma.**) (*XYLORÝCTIDÆ*) .... **STENÓMIDÆ**
Fore wing with the fourth and fifth radial veins stalked; hind wing trapezoidal and usually wider, strongly rounded out at the end of the third medial and first cubital (see couplet 66) .... A few **GELECHÌIDÆ**

93. Second radial vein arising at the apex of the cell; third medial and cubitals also closely crowded from lower angle; male usually with strong sexual modifications; five radials extending to the costa. (**Valentìnia, Holcócera, Dryôpe.**) .... **BLASTOBÁSIDÆ**
Second radial arising distinctly before the apex of the cell, well away from the origin of the third radial 94

94. Five veins extending from the cell to the costa in fore wing............95
Four veins from cell to costa in fore wing, the fifth radial ending decidedly below wing-tip............96
95. Second branch of media in hind wing arising decidedly nearer to the first than the third medial. (**Éthmia.**)............ETHMÌIDÆ
Second medial vein in hind wing arising nearer the third medial, or rarely midway between the first and third. (**Agnépteryx, Depressària, Epicállima.**) **ŒCOPHÓRIDÆ**, part
96. Fourth and fifth radial veins stalked; ocelli absent or vestigial (see couplet 95)............**ŒCOPHÓRIDÆ**, part
All veins in fore wing arising separately, if the fourth and fifth radials are rarely stalked, the ocelli are large (see couplet 90).**YPONOMEÛTIDÆ**, part
97. Radius in fore wing five-branched, all arising from the discal cell; eyes strongly lashed in front; antennæ separated at base by a distance greater than half the width of eyes, usually hooked at tip; small, rarely rather large, stout-bodied butterflies of rapid, erratic flight. Skippers (**Pâmphila, Nisonìades, Eûdamus, Megathȳmus.**) (Pl. 10, figs. 213, 219, 237)....**HESPERÌIDÆ**
Fore wings with some of the radials stalked or absent; eyes rarely lashed; antennæ closer together, the antennal club never pointed and recurved at tip............98
98. *Front pair of legs, at least in the male, more or less strikingly different from* the other pairs; usually not used for walking; the claws of their tarsi, when present, never toothed nor split............99
Front legs like the other pairs, or if slightly reduced in size and structure, with the claws toothed or bifid............108
99. Front tarsus without claws in either sex (Pl. 10, figs. 217, 218); front legs much reduced in size in both sexes, their tarsi in the male with only one joint; in the female usually with five joints............100
Front tarsus of female with claws, that of the male sometimes with a single claw; front legs never much reduced in size. (Pl. 10, figs 214, 215.)....106
100. Discal cell of hind wings closed............101
Discal cell of hind wings open............105
101. Front foot of female ending in a corrugated knob; subcostal vein in fore wing forked at the extreme base; antennæ not scaled above; generally large butterflies with rather bold contrasting coloration; mainly tropical. (**Anôsia** (=*Danais*) [*A. archippus*, Milkweed-butterfly]) (Pl. 10, fig. 235). (*EUPLŒIDÆ*) **LYMNÁDIDÆ**
Front tarsus of female present, though more or less abbreviated. (Pl. 10, fig. 218.)............102
102. Fore wings twice as long as broad............103
Fore wings much less than twice as long as broad............104
103. Antennæ clothed with scales, at least above; front tarsus of female four-jointed; wings opaque; medium-sized, brightly colored butterflies with elongate oval wings; mainly tropical. (**Apostrâphia, Helicônius.**) **HELICONÌIDÆ**
Antennæ naked, wings often in great part translucent and destitute of scales; wings elongate, oval; mainly tropical. (**Dircénna, Ithômia.**) **ITHOMÌIDÆ**

104. Some of the veins at the base of the fore wing greatly swollen; usually small butterflies, rarely rather large; frequently of brownish color with yellowish eyespots or ringed marks (**Cercy̆onis** (=*Satyrus*), **Cœnony̆mpha, Enŏdia** (=*Debis*), **Císsia.**) (Pl. 10. fig. 218.) .... AGAPÉTIDÆ
Veins not swollen at base of fore wing; large tropical species with very broad wings, above with deep, rich colors, below with eye-spots and intricate lines; tropical, in the United States *only* as *accidental* visitors. (**Calĭgo.**) BRASSÓLIDÆ

105. Hind wings with a cradle-like depression along the inner margin in which the abdomen rests; large species, usually with brilliant metallic blue color; tropical. (**Mórpho.**) .... MORPHÒIDÆ
Hind wings without structure of this sort; usually moderate-sized species without brilliant blue coloration; many common brightly colored butterflies. (**Argy̆nnis, Brénthis, Phyciŏdes, Polygŏnia** (=*Grapta*), **Euvanéssa** (=*Vanessa*), **Vanéssa** (=*Pyrameis*), **Basilárchia** (=*Limenitis*), **Anæa.**) (Pl. 10, figs. 217, 236) .... NYMPHÁLIDÆ

106. Palpi very long, porrect, from one-fourth to one-half as long as the body and thickly hairy. (**Hy̆patus.**) .... LIBYTHÈIDÆ
Palpi not elongated, of ordinary size 107

107. Subcosta in hind wing giving off a spur at the base, the humeral vein. (**Calephêlis, Polystígma**) (Pl. 10, fig. 215) (*RIODINIDÆ, ERYCINIDÆ*) LEMONÌIDÆ
Subcosta in hind wing without such a spur at the base; first branch of the media almost always arising at or near the apex of the discal cell; no humeral vein in hind wing; generally small, delicate species, the antennæ ringed with white; often brightly colored and with very slender, tail-like appendages on the hind wings. (**Thécla, Chrysophànus** ["Coppers"], **Lycæna** ["Blues"]) (Pl. 10, fig. 214) (*RURALIDÆ*) .... LYCÆNIDÆ

108. All tarsal claws bifid; anterior tibiæ without pads; hind wing with two well-developed anal veins; medium-sized or rather small butterflies with broad wings; typically yellowish or white with blackish marginal markings. (**Pôntia** (=*Pieris*) [*P. rapæ*, Cabbage butterfly], **Eùrymus** (=*Colias*) ["Yellows"], **Eurêma** (=*Terias.*) .... PIÉRIDÆ
Tarsal claws large, not toothed or bifid; anterior tibiæ with pads; hind wing with only one anal vein 109

109. Radius in fore wing four-branched; discal cell in hind wing not connected to the anal vein by a crossvein; medium-sized butterflies with white ground-color on wings, marked with dusky and usually with a red eye-spot on hind wing; alpine species. (**Parnâssius.**) .... PARNASSÌIDÆ
Radius in fore wing five-branched; anal crossvein present; hind wing usually with a tail-like prolongation; ground-color of wings black; large, showy butterflies with conspicuous, contrasting color pattern. Swallow-tail butterflies. (**Papĭlio, Laértias, Iphiclĭdes**) (Pl. 9, fig. 210). PAPILIÓNIDÆ

ORDER DIPTERA

(*ANTLIATA, HALTERATA, HALTERIPTERA, HAUSTELLATA.*)

Minute to moderate-sized, rarely large insects, usually with good powers of flight; the hind wings replaced by small knobbed structures (halteres): head usually vertical, freely movable; antennæ variable, frequently three-jointed and provided with a sensory bristle (style or arista); mouth-parts suctorial; both the prothorax and metathorax small and fused with the large mesothorax; wings membranous, veins and crossveins not numerous; legs usually alike, the tarsi regularly five-jointed. Metamorphosis complete, the larvæ almost always legless grubs or maggots, frequently with the head retracted and indistinct; pupæ with the appendages more or less adherent, the body sometimes entirely encased in a seed-like capsule (puparium). Food-habits variable. Flies, Mosquitoes, Gnats, Midges.

1. Antennæ generally longer than the thorax, usually composed of from eight to sixteen free joints (Pl. 12, figs. 262, 266, 272) and rarely with a differentiated style or bristle; anal cell widely open, rarely narrowed in the margin of the wing, discal cell usually absent, second vein often forked; calypter absent; palpi usually elongate, hanging downward and comprising four or five joints; body very rarely with bristles. (NEMATÓCERA.)..................2

   Antennæ usually three-jointed, the third joint however often complex (Pl. 12, fig. 283) or bearing a differentiated style (Pl. 12, fig. 300) or arista (Pl. 12, fig. 301); anal cell distally narrowed or closed, sometimes very short or even absent, discal cell usually present, second vein never furcate; palpi short, projecting forward, never with more than two joints. (BRACHÝCERA.).17

2. At least nine veins reach the margin of the wing, discal cell often present, second and fourth veins forked..3

   Less than nine veins terminate in the margin of the wing, no discal cell.....9

3. Costa continuing around the hind margin of the wing; ocelli almost always wanting..4

   Costa much thinned beyond the tip of the wing; a single pad between the tarsal claws; ocelli present; males holoptic; wings usually spotted. (**Rhýphus, Olbiogâster**) (Pl. 12, figs. 276, 288) (*ANISOPIDÆ, PHRYNEIDÆ*).
   RHÝPHIDÆ

4. Veins bare or nearly so, if hairy the mesonotum has a V-shaped suture; legs very long and slender; body and wings elongate; males dichoptic, *i. e.* the eyes not meeting above..5

   Veins, including the hind margin, very hairy or scaly; body hairy or scaly; mesonotum without a transverse suture.............................6

5. Mesonotum without a transverse suture; second vein strongly arched forward. (**Díxa**)..**DÍXIDÆ**
Mesonotum with a more or less distinct suture; female with a conical ovipositor. Crane-flies, Daddy-long-legs 7

6. Wings ovate or pointed, held folded roof-like against the body, veins very hairy; tibiæ without terminal spurs; small species. Moth-flies. (**Psychòda, Perícoma**) (Pl. 12, fig. 263)..........................**PSYCHÓDIDÆ**
Wings narrow, not thus folded against the body; veins scaly; tibiæ with terminal spurs; antennæ of the males usually feathered with long hairs. Mosquitoes. **Cùlex** [*C. quinquefasciatus*, Dengue-fever and Filaria mosquito], **Aèdes** [*A. calopus*(=*Stegomyia fasciata*), Yellow-fever mosquito], **Anópheles** [*A. quadrimaculatus*, Malaria mosquito]) (Pl. 12, fig. 267).....**CULÍCIDÆ**

7. Suture of mesonotum distinctly V-shaped; two anal veins present.........8
Mesonotal suture not distinctly V-shaped, but incomplete or curved; one anal vein present. (**Bittacomórpha, Ptychóptera**) (Pl. 12, fig. 269) (*LIRIOPEIDÆ*)..................................... **PTYCHOPTÉRIDÆ**

8. Last joint of palpi whiplash-like, much longer than the three preceding together; antennæ with rarely more than thirteen joints; auxiliary vein ending in the first vein by an abrupt curvature at the tip, not connected with the first by a crossvein. (**Típula, Pachyrhìna, Ctenóphora**) (Pl. 11, fig. 240; Pl. 12, fig. 273)..**TIPÙLIDÆ**
Last joint of the palpi shorter or not much longer than the two preceding together; antennæ six- to sixteen-jointed, rarely more; auxiliary vein usually ending in the costa and connected with the first vein by a distinct crossvein. (**Limnòbia, Erióptera, Limnóphila, Trichócera**) (including CYLINDROTOMIDÆ)......................................**LIMNOBÌIDÆ**

9. Antennæ composed apparently of two joints and a terminal nine- or ten-jointed arista; a small but broad second basal cell present; rare small species. (**Orphnéphila**) (Pl. 12, fig. 284)....................**ORPHNEPHÍLIDÆ**
Outer part of the antennæ not formed like an arista; second basal cell absent, or, if present, narrow..10

10. Wings with a secondary neuration like a fine network of creased lines; slender long-legged species. (**Bibiocéphala, Blepharócera**) (Pl. 12, fig. 277) (*LIPONEURIDÆ*) ....**BLEPHAROCERIDÆ**
Wings without such secondary neuration.............................11

11. Second basal cell present; antennæ usually shorter than the thorax, rather stout, without constrictions between the joints; eyes of the male often large, ocelli almost always present. (**Bìbio, Dìlophus, Plècia**) (Pl. 11, fig. 241; Pl. 12, fig. 266) (including *PACHYNEURIDÆ*).........**BIBIÓNIDÆ**
Second basal cell wanting..12

12. Antennæ shorter than the thorax, rather stout, composed of ten or eleven closely united joints, never feathery; eyes of males meeting above; body stout, legs strong; anterior veins strong, posterior veins weak. Buffalo-gnats, Black-flies. (**Simùlium**) (Pl. 11, fig. 243; Pl. 12, fig. 272) (*MELUSINIDÆ*)..**SIMULÌIDÆ**
Antennæ long and slender, the joints longer than broad, rarely (Ceroplatus) the antennæ are flattened; body slender.............................13

13. Tibiæ with apical spurs, coxæ usually long; three or two ocelli almost always present; eyes separated. Fungus-gnats. (**Mycetóphila, Macrócera, Mycomỳia** (=*Sciophila*), **Ceroplàtus**) (Pl. 12, fig. 280) (*FUNGIVORIDÆ*). **MYCETOPHĬLIDÆ**

Tibiæ usually without apical spurs; often no ocelli; coxæ at most moderately long 14

14. Costa continuing around the hind margin of the wing; wings almost always finely hairy and usually with three longitudinal veins, the last forked, and without apparent crossveins; eyes usually separated; minute, delicate species. Gall-gnats. (**Cecidomỳia, Mayetìola** [*M. destructor*, Hessian fly], **Dasyneùra, Lasióptera, Contarínia** [*C. tritici*, Wheat midge; C. (= *Diplosis*) *pyrivora*, Pear midge].) (Pl. 11, fig. 242; Pl. 12, fig. 262). (*ITONIDIDÆ*) **CECIDOMYÌIDÆ**

Costa not or but weakly continued on the hind margin, more than three veins present; eyes usually meeting above in the males 15

15. Antennal joints more or less constricted, often feathered and bushy in the male, six to fifteen in number; wings usually narrow; eyes kidney-shaped or oval; ocelli wanting or vestigial. Midges, Gnats, Punkies. **Ceratopògon** [Punkies], **Chirónomus, Orthoclàdius, Tânypus**) (Including ERETMOPTERIDÆ and STENOXENIDÆ) (*TENDIPEDIDÆ*). **CHIRONÓMIDÆ**

Antennal joints rarely constricted and at most verticillate, *i. e.* furnished with whorls of loose hairs; wings usually more oval; eyes kidney-shaped, meeting on the vertex; ocelli distinct 16

16. Antennal joints longer than broad; hind margin of the wing slightly thickened; tibial spurs distinct; eyes narrow above the front. (**Sciara, Lestrèmia, Campylomỳza**) . . . . (*LYCORIIDÆ*) **SCIÁRIDÆ**

Antennal joints shorter than broad; hind margin of the wing not thickened; eyes relatively broad above the front. (**Scatópse, Aspístes.**) **SCATÓPSIDÆ**

17. Empodia developed pulvilliform, that is, three nearly equal pads under the tarsal claws (Pl. 12, fig. 261); head and thorax without strong bristles. (EREMOCHÆTA) 18

Empodia wanting or represented by a bristly hair, therefore only two tarsal pads (Pl. 12, fig. 259); bristles often well developed; third antennal joint never truly annulated 25

18. Third joint of the antennæ complex, annulated into four to eight apparent segments, or the antennæ more than five-jointed 19

Third joint of the antennæ simple, not composed of rings 23

19. No vein on the hind margin of the wings, prefurca (*i. e.* the petiole of the second and third veins) arising opposite the base of the small and anteriorly placed discal cell, anterior veins usually crowded near the costa, the other veins faint; scutellum often armed. (**Stratiomỳia, Sárgus, Nemótelus**) (Pl. 11, fig. 244) . . . . **STRATIOMYÌIDÆ**

Costa continuing around the hind margin of the wing, prefurca longer (short only in Pantophthalmidæ), veins not crowded forward, the fork of the third vein usually enclosing the tip of the wing, five posterior cells 20

20. Calypteres small or vestigial; head not hemispherical, the occiput convex . . 21
Calypteres conspicuous; third antennal joint composed of four to eight annuli; head widely hemispherical; females bloodsucking. Horse-flies, Gad-flies. (**Tabànus, Chrŷsops, Sìlvius**) (Pl. 11, fig. 247; Pl. 12, figs. 258, 283).
TABÁNIDÆ

21. A slight spur on the *middle* tibiæ only; second submarginal cell widely triangular; fourth posterior cell closed; gigantic, tropical flies. (**Pantopthàlmus**) (Pl. 11, fig. 246) . . . . (*ACANTHOMERIDÆ*) **PANTOPHTHÁLMIDÆ**
At least the middle tibiæ with evident spurs; second submarginal cell not wide, fourth posterior cell usually open 22

22. Face flat or produced, the facial orbits and the cheeks not sutured; eyes of the male not meeting; antennæ of Rhachicerus pectinate and with about thirty divisions. (**Xylóphagus, Rhachícerus**) (Pl. 12, figs. 286, 290) (including *RHACHICERIDÆ.*) . . . . (*ERINNIDÆ*) **XYLOPHÁGIDÆ**
Facial orbits and cheeks separated from the central part; eyes of males meeting; scutellum of Cœnomyia spined. (**Cœnomŷia, Arthròpeas**) (Pl. 12, fig. 287) . . . . **CŒNOMYÌIDÆ**

23. At least the posterior tibiæ with spurs; costa encompassing the wing margin, anterior crossvein distinct; calypteres vestigial. (**Léptis, Chrysopìla, Symphoromŷia**) (Pl. 12, fig. 291).
(*LEPTIDÆ= LEPTIDIDÆ*) **RHAGIÓNIDÆ**
Tibiæ with short or no spurs; costa greatly thinned beyond the tip of the wing, anterior crossvein usually absent or located near the base of the discal cell, 24

24. Head very small as compared with the greatly *hump-backed* body; calypteres inflated; posterior veins not parallel with the hind margin of the wing; eyes of both sexes broadly contiguous. (**Acrócera, Opsèbius, Oncòdes, Eulónchus**) (Pl. 11, fig. 245) (*ACROCERIDÆ, HENOPIDÆ, ONCODIDÆ*) . . . . **CŶRTIDÆ**
Head as wide as the depressed thorax; calypteres vestigial; posterior veins parallel with the hind margin, first basal cell very long, its forward border continued obliquely across the wing as a "diagonal vein." (**Hirmoneùra, Rhynchocéphalus**) (Pl. 12, fig. 295) . . . . **NEMISTRÍNIDÆ**

25. Anal cell much longer than the second basal, either open, or closed in or near the margin of the wing, basal cells relatively long, third vein almost always forked 26
Anal cell when present shorter, closed some distance from the wing-margin, if long and acute the third vein is not forked; small crossvein never formed, 31

26. Vertex plane or convex, the eyes not bulging, eyes of males often meeting; legs not robust 27
Vertex sunken, the eyes bulging and never contiguous; wing-veins numerous; often large species with strong legs 30

27. Small crossvein present (Pl. 12, fig. 258, p. c. v.), five posterior cells; abdomen rather long and tapering 28
Small crossvein absent, four or three posterior cells, if five posterior cells present the extra one is due to an extra vein bisecting the third; abdomen usually oval 29

28. Fourth vein ending before the wing-tip; at least the scutellum bristly; antennæ with a very short style; eyes separated; palpi broadened at tip. (**Apiócera, Rhaphiomȳdas**) .... APIOCÉRIDÆ

Fourth vein ending beyond the tip of the wing; body usually furry rather than bristly; palpi not broadened apically. (**Therêva, Psilocéphala, Tabûda**) (Pl. 12, fig. 293) .... THERÉVIDÆ

29. Proboscis long and thin; body usually furry and stout though rarely (Systropus) extremely slender and bare; a small style usually present; fourth vein ending beyond tip of the wing. (**Ánthrax, Exoprosôpa, Bombȳlius, Gêron, Sȳstropus.**) (Pl. 11, fig. 249; Pl. 12, figs. 265, 294) .. BOMBYLÎIDÆ

Proboscis hidden; body bare; antennæ without a style; fourth vein ending at the tip of the wing. (**Scenópinus, Pseudatríchia**) (Pl. 11, fig. 248). (*OMPHRALIDÆ*) SCENOPÍNIDÆ

30. Body without bristles; fourth vein curving forward, neuration complex, prefurca (the stalk of the second and third veins) short; antennæ with a clubbed style; proboscis with fleshy expanded tip, palpi vestigial. (**Mȳdas, Leptomȳdas**) (Pl. 12, fig. 298) .... (*MYDASIDÆ*) MYDÀIDÆ

Body usually with bristles, face bearded; fourth vein not curving forward, neuration normal, prefurca long; proboscis adapted for piercing, not fleshy, palpi usually prominent. Robber-flies. (**Leptogâster, Cyrtopôgon, Láphria, Êrax, Proctacánthus**) (Pl. 12, fig. 264) .... ASÎLIDÆ

31. No frontal suture; anal crossvein usually reflexed; when the anal cell is pointed the arista is terminal and the calypteres and alula are not prominent. . 32

If the anal crossvein is reflexed a frontal suture is evident, if the frontal lunule is obscure the anal cell is longer than the second basal cell; arista almost always dorsal; calypteres and alula usually pronounced. (CYCLÓRRHAPHA) 35

32. Neuration fairly normal, without faint oblique veins; antennæ evidently two- or three-jointed 33

Wings, when present, with several stout anterior veins running into the costa and other weak ones obliquely extending across the wing; antennæ placed low, apparently single-jointed and with a long arista; hind legs long, their femora compressed; small, hunchbacked, quick running flies. (**Dohrníphora, Phôra, Hypócera, Aphiochæta.**) (Pl. 11, fig. 250) ...... PHÓRIDÆ

33. Wings rounded at the tip, second vein ending considerably before the wing-tip, crossveins present; oral bristles absent; eyes of males often meeting; face usually narrow; predaceous species. (MICRÓPHONA, ORTHOGENYA.) . . 34

Wings pointed, no crossveins except at the base, second basal cell short, second vein ending almost at the tip of the wing; face with oral vibrissæ; eyes separated. (ACRÓPTERA) (**Lonchóptera.**) (Pl. 11, fig. 254; Pl. 12, fig. 278). (*MUSIDORIDÆ*) LONCHOPTÉRIDÆ

34. At least one basal cell evident, discal cell usually separate from the second basal cell; calypteres small; proboscis usually rigid; antennal style or arista usually terminal; abdomen typically with seven segments, male genitalia never inflexed; color almost never metallic; third vein sometimes forked.

(**Hŷbos, Hemerodrômia, Clinócera, Platypâlpus, Rhamphomŷia**) (Pl. 11, fig. 251; Pl. 12, figs. 268, 270, 300.)
(*EMPIDÆ*, including *HYBOTIDÆ*) **EMPÍDIDÆ**

Basal cells small and indistinct, discal cell merged with the second basal cell, third vein never forked; calypteres rather large and fringed; proboscis almost always fleshy; abdomen typically with five or six segments excluding the large inflexed genitalia of male; usually metallic green. (**Sciapus, Dolíchopus, Gymnoptérnus, Chrysôtus, Hydróphorus.**) (Pl. 12, figs. 274, 299)..**DOLICHOPÓDIDÆ**

35. Anal cell elongate, acute, usually closed toward the wing-margin, but at least longer than the second basal cell which is generally long; frontal suture rarely distinct. (Aschìza, Atherícera)..........................36

Anal cell, if present, short, closed far from the wing-margin, not acutely produced except rarely by a lobiform prolongation, second basal cell much shorter than the third posterior cell except in the abnormal neuration of some Pupipara; frontal lunule and suture almost always distinct; never more than three posterior cells; marginal and submarginal cells never closed; third antennal joint almost always with dorsal arista; bristles of body and legs usually distinct. (Schizóphora.)..............................39

36. Proboscis very rarely elongated; eyes of males usually meeting...........37

Proboscis elongate and slender, often folding; face usually with a groove or grooves under the antennæ; front broad in both sexes; antennæ with terminal style or dorsal arista; no bristles. (**Physocéphala, Myôpa, Zôdion, Oncomŷia**) (Pl., 11, fig. 252; Pl. 12, fig. 292)................**CONÓPIDÆ**

37. First posterior cell open, no extra vein crossing the anterior crossvein; rather small, dull colored species..38

First posterior cell closed, usually an extra vein between the third and fourth veins; head and usually body without bristles; arista almost always dorsal; usually bright colored flower flies. (**Páragus, Sŷrphus, Erístalis, Helóphilus, Xylôta**) (Pl. 12, figs, 281, 301)...................**SÝRPHIDÆ**

38. Arista terminal; hind tibiæ and tarsi dilated, especially in the male; head and thorax with bristles. (**Platypéza, Callimŷia**) (Pl. 12, fig. 285) (*CLYTHIDÆ*)..**PLATYPÉZIDÆ**

Arista dorsal; hind legs not dilated; without true bristles. (**Pipúnculus, Châlarus.**) (Pl. 12, fig. 289)...........(*DORYLAIDÆ*) **PIPUNCÚLIDÆ**

39. Legs not broadly separated; head movably separated from the thorax; adults not ectoparasites upon warm-blooded vertebrates; rarely viviparous, in which case the new-born larvæ are young. (Eumyìidæ, Muscoídea, Myiodária.)...40

Legs attached to the sides of the body; head small and closely united with the thorax, or folding back into a dorsal groove; adult flies of a leathery or horny structure, often wingless, living parasitically upon warm-blooded vertebrates; viviparous, the new-born larvæ well developed, ready for pupation. (Pupípara. Nymphípara, Eproboscídea, Omalóptera)......79

40. At least the lower calypter large; posthumeral and intraälar bristles usually both present; thorax with a complete transverse suture, posterior callosity

present; front of male narrow or the eyes meeting; auxiliary vein always distinct, first vein never short. (SCHIZOMETÒPA, CALYPTERÀTÆ.) 41

Lower calypter vestigial or wanting; posthumeral bristle present only in some Scatophagidæ; thorax without a complete transverse suture, posterior callosity usually absent; a visible membrane connecting the dorsal and ventral segments; front of both sexes of equal width, or if wider in the female, the greater width is due to a widening of the middle strip; fourth vein nearly straight, if curved never with an appendage; often very small species. (HOLOMETÒPA, ACALYPTERÀTÆ; BORBOROÍDEA.) 51

41. Mouth opening small, the mouth-parts wanting or vestigial, not functional; vibrissæ and bristles absent, no sternopleural bristles; ventral membrane evident, at least at the base of the abdomen. Bot-flies................42

Mouth opening normal, the mouth-parts functional; usually with sternopleural bristles at least 43

42. No hypopleural bristles or hairs; costa extending to the third vein; first posterior cell very widely open; calypteres rather small. (**Gastróphilus** [*G. equi*, Horse Bot-fly].)..................................**GASTROPHÍLIDÆ**

Hypopleuræ bearing hairs or bristles; costa extending to the fourth vein; first posterior cell closed or narrowed; calypteres large. (**Œstrus** [*Œ. ovis*, Sheep Bot-fly], **Hypodérma** [*H. lineata*, Ox warble], **Cuterébra**) (including *HYPODERMATIDÆ, CUTEREBRIDÆ*)..................**ŒSTRIDÆ**

43. Both hypopleural and pteropleural bristles or hairs present in a more or less vertical row; fourth vein bending or curving forward; when three sternopleural bristles usually but one behind. (TACHINOÍDEA.)..............44

Either the hypopleural or pteropleural hairs or bristles or both absent; ventral membrane usually distinct; when three sternopleural bristles present usually two behind...50

44. Facial plate more or less convexly produced nose-like below the vibrissal angles and fused with the lowest part (epistome); ventral membrane present; abdomen destitute of stout bristles. (**Alóphora, Phorántha, Cistogáster, Trichópoda**) (including GYMNOSOMATIDÆ with four, not five abdominal segments)...**PHASÌIDÆ**

Facial plate flattened, at most slightly produced; ventral membrane not visible; abdomen bearing some stout bristles 45

45. Facial plate receding and short, the cheeks very broad, vibrissæ located near the middle of the face; antennæ short. (**Microphthálma.**) **MEGAPROSÓPIDÆ**

Facial plate long and never conspicuously receding, the oral margin more or less prominent, vibrissal angles near the oral margin; antennæ usually long, 46

46. Second ventral segment of the abdomen more or less overlapping the edges of the dorsal segment...47

Edges of the dorsal segments overlapping all the ventral ones............49

47. Hindermost posthumeral bristle located lateral to the presutural bristle; fifth ventral segment of the male with a split hind margin, sometimes strongly developed; usually metallic and with plumose arista. (**Callíphora** [Blow-

fly], **Lucília** [Green-bottle fly] **Cynomÿia** [Blue-bottle fly], **Pollénia, Chrysomÿia** [*C. macellaria,* Screw-worm]) (*Pl. 13, figs. 302, 303, 304, 305*).
CALLIPHÓRIDÆ

Last posthumeral bristle placed in front or inside of the presutural bristle; arista bare or hairy at the base 48

48. Fifth ventral segment of the male with a straight hind margin, or entirely absent. (**Sarcóphaga, Pachyophthálmus, Metòpia.**)...**SARCOPHÁGIDÆ**

Fifth ventral segment of the male split to the middle. (**Phÿto, Melanóphora.**)
RHINOPHÓRIDÆ

49. No presutural intraälar bristle (Pl. 12, *fig. 303*); second to *fifth* ventral segments hidden; antennæ usually at or below the middle of the eye, arista usually hairy; legs often lengthened. (**Ptilodéxia, Therèsia, Thelàira.**
DEXÌIDÆ

Intraälars usually extending in front of the suture, if not the ventral segments broadly visible or the fifth ventral of the male vestigial; antennæ above the middle of the eye, with a bare arista; at least two posthumeral and three posterior intraälar bristles. (**Tâchina, Ocýptera, Exorísta, Árchytas, Gònia**) (Pl. 11, fig. 253; Pl. 12, fig. 297) (Including EXORISTIDÆ, MASICERIDÆ, OCYPTERIDÆ, HISTRICIIDÆ and two score of other so-called families) (*LARVÆVORIDÆ*) ....**TACHÍNIDÆ**

50. Either the hypopleural or pteropleural hairs or bristles present (Pl. 13, fig. 303); basal bristles of the abdomen reduced; fourth vein bending or curving forward; arista feathered to the tip. **Músca** [*M. domestica,* Housefly], **Moréllia, Graphomyia, Stomóxys** [*S. calcitrans,* Stable-fly], **Hæmatóbia** [*H.* (*Lyperosia*) *serrata,* Horn-fly]) (Pl. 12, figs. 259, 296)......**MÚSCIDÆ**

Neither the hypopleural nor pteropleural hairs or bristles present; abdomen usually bristly; fourth vein usually curving backward; arista sometimes bare. (**Cœnòsia, Arícia, Fánnia** (= *Homalomyia*), **Muscìna, Myiospìla, Phórbia** [*P. brassicæ,* Cabbage and Radish maggot; *P. cepetorum,* Onion maggot].)
ANTHOMYÌIDÆ

51. Auxiliary vein distinctly separate from the first vein and ending in the costa, the first vein usually ending near the middle of the wing; anal cell present, 52

Auxiliary vein less distinct, sometimes partly touching the first vein or vestigial, the first vein usually ending much before the middle of the wing.....66

52. Oral vibrissæ present (Pl. 13, fig. 305); abdomen with more than four visible segments; eyes bare; wings rarely pictured.........................53

Oral vibrissæ absent...57

53. Costa beset with numerous spines; postvertical bristles convergent; tibiæ with spurs and with preapical bristles. (**Lèria, Helomÿza, Tephrochlámys.**)
HELOMÝZIDÆ

Costa not spinose, even at the auxiliary vein; postvertical bristles divergent or (Phycodromia) subparallel.............................54

54. Front bristly on the sides and on the vertex..........................55

Front never bristly near the antennæ; abdomen somewhat elongate and usually narrower at the base; small, black scavenger flies. (**Sépsis, Nemópoda.**)
SÉPSIDÆ

55. Thorax convex, face and cheeks not remarkably bristly 56
Mesonotum and scutellum flattened; front, face and cheeks bristly; all the tibiæ spurred and with preapical bristles; last tarsal joint large. (**Cœlôpa, Omomŷia.**) .... **PHYCODRÓMIDÆ**

56. Central strip of the front (frontalia) usually well differentiated from the sides (orbits) (Pl. 13, fig. 304); first vein nearly half the wing-length; second basal cell not minute; crossveins not close together; frontal cross-bristles absent. (**Cordylûra, Parallelómma, Scatôphaga**) (Pl. 12, fig. 271) (*CORDYLURIDÆ, SCATOMYZIDÆ, SCOPEUMIDÆ*) .. **SCATOPHÁGIDÆ**
Central strip of the front not differentiated from the sides; first vein about one-third of the wing-length; second basal cell minute; crossveins sometimes approximated; frontal cross-bristles sometimes present. (**Clûsia, Heteroneûra.**) .... **HETERONEÙRIDÆ**

57. First posterior cell closed or narrowed in the margin; abdomen elongate; legs long or very long 58
First posterior cell widely open, if narrowed the abdomen is short and the legs are not unusually long and slender 60

58. Eyes large, the cheeks and posterior orbits narrow, occiput concave 59
Head more or less globular, the cheeks broad and the face retreating; proboscis short. (**Micropéza, Calóbata, Nèrius.**)
(*CALOBATIDÆ*) **MICROPÉZIDÆ**

59. Proboscis short; arista dorsal; ovipositor not lengthened. (**Tanypéza.**)
TANYPÉZIDÆ
Proboscis and ovipositor greatly lengthened; arista terminal (**Stylogáster**) (see couplet 36) .... **CONÓPIDÆ**

60. First posterior cell narrowed; femora and usually the hind tibiæ enlarged; all the tibiæ with preapical bristle; scutellum usually prominent; basal cells relatively large; tropical species. (**Rhopalomèra, Willistoniélla.**)
RHOPALOMÉRIDÆ
First posterior cell widely open, if rarely narrowed the femora are not thick .. 61

61. Hind tibiæ with a preapical bristle, apical tibial bristles present; ovipositor neither flat nor drawn out; usually two fronto-orbital bristles; wings sometimes pictured 62
Hind tibiæ without preapical bristle, middle tibiæ alone with apical bristles; front femora bristly beneath; ovipositor flattened and more or less projecting; postvertical bristles divergent when present; clypeus prominent; wings usually pictured 64

62. Postvertical bristles divergent when present; second antennal joint without a dorsal bristle; mesopleural and usually sternopleural bristles wanting; front femora not bristly beneath; anal vein reaching the wing-margin .. 63
Postvertical bristles convergent; second antennal joint with a dorsal bristle; one or two sternopleural and a mesopleural bristle present; lower outer edge of the front femora bearing bristles; anal vein obliterated toward the tip. (**Lauxânia, Camptoprosopélla.**) .. (*SAPROMYZIDÆ*) **LAUXANÌIDÆ**

63\. Clypeus well developed; vibrissal angle very weak; more than two dorsocentral bristles; sternopleural bristles sometimes present. (**Neuróctena, Heterochìla.**) .... DRYOMÝZIDÆ

Clypeus vestigial; not more than two dorsocentral bristles; rarely a single sternopleural bristle. (**Sépedon, Sciomỳza, Tetanócera.**)
(*SCIOMYZIDÆ*) **TETANOCÈRIDÆ**

64\. Fronto-orbital bristles extending to the antennæ; auxiliary vein abruptly bent forward before the tip of the first vein, anal cell angular (see couplet 70).
TRYPÉTIDÆ

Fronto-orbital bristles confined to the vertex; auxiliary vein not bent at the end but gently curving 65

65\. Anal cell usually acute, the anal vein reaching the margin; usually two fronto-orbital bristles. (**Pyrgòta, Rivèllia, Euxésta, Chætópsis**) (Pl. 12, *fig* 275) (including PYRGOTIDÆ (=*DORYCERIDÆ*), ULIDIIDÆ, PLATYSTOMATIDÆ, etc.) .... **ORTALÍDIDÆ**

Anal crossvein recurved, the anal cell never acute, anal vein abbreviate; one fronto-orbital bristle. (**Pallóptera, Lonchæa.**) .... **LONCHÆIDÆ**

66\. Head laterally produced as a process bearing the eye; second basal and discal cells united; no vibrissæ; front femora thickened. (**Sphyracéphala.**)
DIÓPSIDÆ

Head not produced at the sides, the eyes not stalked 67

67\. First joint of hind tarsi (metatarsus) shorter than the following joint and more or less thickened; vibrissæ present; front usually bristly; third antennal joint short and rounded; small dull-colored species found about excrement or marshes. (**Leptócera** (=*Limosina*), **Sphærócera, Bórborus**) (Pl. 9, *fig.* 255) (*COPROMYZIDÆ, CYPSELIDÆ, SPHÆROCERIDÆ*)
BORBÓRIDÆ

Hind metatarsi longer than the next joint and slender 68

68\. Legs very long and slender, the hind femora slightly swollen apically; first posterior cell narrowed, second basal cell complete; arista feathered; no vibrissæ; tropical species (see couplet 58). (**Cardiacéphala.**)
MICROPÉZIDÆ

Legs never very elongate; if the first posterior cell is rarely narrowed, otherwise disagreeing 69

69\. Scutellum elongate, triangular, margined with protuberances; femora thickened; ovipositor closing together telescope-like; basal cells large; tropical species (see couplet 60). (**Rhinótora.**) .... **RHOPALOMÉRIDÆ**

Not such flies 70

70\. Auxiliary vein becoming weak and abruptly turned forward at its end; anal cell angular or acutely lobed at its posterior distal end; second basal cell distinct; wings almost always pictured; no preapical tibial bristles; no vibrissæ; fronto-orbital bristles numerous. (**Ceratìtis** [*C. capitata*, Mediterranean fruit-fly], **Epóchra** [*E. canadensis*, Currant maggot], **Trypèta, Rhagolètis** [*R. pomonella*, Apple maggot], **Tephrìtis.**)
(*EURIBIIDÆ*) **TRYPÉTIDÆ**

Auxiliary vein not abruptly ending a considerable distance before the end of the first vein; anal cell not acute 71

71\. Costa microscopically broken twice, just beyond the humeral crossvein and at the end of the auxiliary vein (best seen by transmitted light); postvertical bristles convergent; no bristle above the front coxæ..................72

Costa not broken near the humeral crossvein; mouth-opening not wide; arista not feathery..74

72\. Anal cell wanting and basal cell fused with the discal cell (except Canace); no vibrissæ; clypeus very large; mouth-opening very large, the center of the face raised; foremost fronto-orbital bristles diverging; arista bare, hairy or feathered; dark-colored, shore-living species. (**Notíphila, Hydréllia, Párydra, Éphydra.**)................................**EPHÝDRIDÆ**

Anal cell almost always present; second basal cell usually complete; vibrissæ present; mouth-opening not large; center of the face concave..........73

73\. Foremost pair of fronto-orbital bristles converging; bristles of the middle of front less evident; arista loosely pubescent; clypeus small; occiput reaching forward under the eyes. (**Milichiélla, Desmometòpa, Meoneùra**) (Pl. 12, fig. 282)....................................**MILICHÌIDÆ**

Foremost fronto-orbital bristles proclinate; interfrontal bristles rare; arista almost invariably feathered; clypeus large; occiput not forming part of the cheeks. (**Phórtica, Cyrtonòtum, Drosóphila** [Pomace-fly]) (including ASTEIDÆ).................................**DROSOPHÍLIDÆ**

74\. Anal and second basal cells absent; interfrontalia large; postvertical bristles converging; usually no vibrissæ, fronto-orbital or interfrontal bristles. (**Meromỳza** [*M. americana*, Wheat-stem maggot], **Chlòrops, Hippelàtes, Óscinis** (=*Botanobia*) [Frit-fly]) (Pl. 9, fig. 256) (*OSCINIDÆ*). **CHLORÓPIDÆ**

Anal and basal cells complete.......................................75

75\. Oral vibrissæ present (exceptionally absent in Geomyzidæ); costa almost always broken near the end of the first vein........................76

Oral vibrissæ absent; auxiliary vein ending in the costa; clypeus small....78

76\. Postvertical bristles convergent when present; auxiliary vein independently ending in the costa; clypeus large; foremost fronto-orbital bristles directed backward; mesopleural bristles present; cilia of the calypteres loose. (**Trixóscelis, Diástata, Anthomỳza**) (Pl. 12, fig. 279). (*OPOMYZIDÆ*) **GEOMÝZIDÆ**

Postvertical bristles divergent when present; fringe of the calypteres dense; clypeus small... 77

77\. Only the uppermost fronto-orbital bristles present; auxiliary vein ending in the costa; no mesopleural or prothoracic bristles; arista bare. (**Prochylìza, Pióphila** [*P. casei*, cheese-skipper] **Mycetàulus.**)..........**PIOPHÍLIDÆ**

Lower fronto-orbitals convergent; auxiliary vein usually ending in the first vein; mesopleural and one prothoracic bristles present; arista closely pubescent. (**Cerodónta, Agromỳza, Phytomỳza, Odínia.**) (including PHYTOMYZIDÆ) **AGROMÝZIDÆ**

78\. Costa usually entire, at most slightly weakened just before the end of the auxiliary vein; basal cells small; postvertical bristles convergent; arista bare;

densely gray dusted species, the abdomen usually marked with black or brown spots. (**Ochthíphila, Leucòpis.**) .... **OCHTHIPHÍLIDÆ**

Costa interrupted near the end of the first vein; basal cells relatively large; postvertical bristles divergent when present; arista pubescent; rather slender, usually shining species with the antennæ often very long and hanging downward. (**Chylìza, Loxócera, Psìla.**) .... **PSÍLIDÆ**

79. Head folding back on the dorsum of the thorax; wingless flies parasitic on bats. (**Nycteríbia.**) .... **NYCTERIBÌIDÆ**

Head sunk into the thorax, but not folded back, winged or wingless species, parasitic on birds or mammals 80

80. Palpi broader than long, projecting leaf-like in front of the head; wings when present with distinct parallel veins and outer crossveins; claws simple; almost always parasitic on bats. (**Trichòbius, Strébla.**) .. **STRÉBLIDÆ**

Palpi forming a sheath for the proboscis; wings if present with the veins crowded along the costa and with weaker oblique ones extending across the wings; tarsal claws strong and often armed with a series of small teeth. (**Hippobósca, Olférsia, Melóphagus** [*M. ovinus*, Sheep-tick]) (Pl. 11, fig. 257) .... **HIPPOBÓSCIDÆ**

ORDER SUCTORIA.

(*SIPHONAPTERA, APHANIPTERA, RHOPHOTEIRA.*)

Small, wingless, strongly compressed, jumping insects, parasitic in the adult condition on warm-blooded animals; head small, indistinctly separated from the thorax; antennæ short and thick, placed in depressions behind the small simple eyes which are sometimes wanting; mouth formed for sucking; thoracic segments not fused; coxæ large, close together; tarsi five-jointed; cerci one-jointed; larvæ worm-like; pupæ enclosed in cocoons. Fleas.

1. Thoracic segments not strongly shortened and constricted, their side plates extending over only one abdominal segment; labial palpi with three or more false joints; maxillary palpi almost always shorter than the front coxæ; third joint of antennæ with nine more or less distinctly separated false joints 2

Thoracic segments strongly shortened and constricted, the metathoracic side plates extending over two or three abdominal segments; head strongly angulated anteriorly; labial palpi without false joints; maxillary palpi extending beyond the front coxæ; third antennal joint without completely separated false joints; fully developed female with enormously dilated abdomen, living beneath the skin during her final development. (**Dermatóphilus** (= *Sarcopsylla*, = *Rhynchoprion*) [*D. penetrans*, Jigger-flea]) (Pl. 13, fig. 310) (*SARCOPSYLLIDÆ, RHYNC OPRIONIDÆ*). **DERMATOPHÍLIDÆ**

2. Maxillæ triangular, acute at apex 3

Maxillæ clubbed or subquadrangular; face strongly sloping forward and recurved just above the mouth, where there are two tooth-like plates on each side;

eyes absent; pronotum, and usually abdomen with comb-like arrangements of spines; species occurring on bats (**Ceratopsýllus.**) **CERATOPSÝLLIDÆ**

3. Spines of hind tibiæ in a single row, or in pairs (Pl. 13, figs. 306, 308)........4
Spines of hind tibiæ numerous, in close-set, short transverse rows on the hind border, about four spines in each row. (**Hystrichopsýlla.**) **HYSTRICHOPSÝLLIDÆ**

4. Spines of hind tibiæ in pairs and few in number, not in a very close-set row. (**Pùlex** [*P. irritans*, Human flea], **Ctenocéphalus** [*C. canis*, Dog flea; *C. felis*, Cat flea], **Xenopsýlla** (= *Læmopsylla*) [*X. cheopis*, Tropical rat flea, Plague flea], **Ceratophýllus** [*C. fasciatus*, Rat and plague flea of temperate regions]) (Pl. 13, figs. 306, 307, 308, 309, 311, 312).................. **PULÍCIDÆ**
Spines of hind tibiæ numerous, mostly single and in a close-set row. (**Ctenopsýllus.**)..................................**CTENOPSÝLLIDÆ**

ORDER HOMOPTERA.

(*RHYNCHOTA*, part.)

An assemblage of very diverse insects, difficult to define in a general way; usually of moderate or small size, rarely large; in the active forms four wings are present in both sexes; in the scale insects only the males are winged, and they have the hind wings absent; wings usually sloping over the sides of the body; fore wings never modified into a heavy basal and thinner apical portion; beak jointed, inserted at the hind edge of the head and extending between the front coxæ, the basal joints very short, rarely the beak is absent in the males; cerci wanting. Metamorphoses usually incomplete, sometimes complete in the male, rarely so in the female; all the species plant-feeders.

1. Tarsi three-jointed; antennæ very short, with a small terminal bristle; beak plainly arising from the head; active free-living species. (AUCHENORRHÝNCHA.)..2
Tarsi two- or one-jointed; antennæ usually well developed, sometimes absent, without conspicuous terminal bristle; beak appearing to arise between the front legs, rarely absent in the male; species often incapable of moving, or inactive in the female sex 14

2. Three ocelli, placed on the disk of the vertex (Pl. 16, fig. 376); antennæ with short basal joint, terminated by a hair-like process which is divided into about five joints; front femora thickened and generally spined beneath; male with a sound-producing organ on each side at the base of the abdomen; comparatively large species. (**Cicàda** [*C. septendecim*, Periodical Cicada], **Tibìcen, Platypèdia**) (Pl. 15, figs. 348, 349)................**CICÁDIDÆ**
Two ocelli, rarely three or more....................................3

3. Ocelli (rarely absent) placed between the eyes (Pl. 16, fig. 377), on the vertex, on the front, or on the front margin of the head 4
   Ocelli placed beneath or near the eyes, usually in cavities of the cheeks; pronotum neither armed nor unusually developed. (FULGOROÍDEA) 8

4. Pronotum prolonged backwards into a hood or process of variable form extending over the abdomen and usually much elevated; antennæ inserted between and in front of the eyes. Tree-hoppers. (**Cerêsa** [*C. bubalus*, Buffalo tree-hopper], **Enchenôpa, Telamôna**) (Pl. 14, fig. 345; Pl. 15, fig. 350, 351, 352; Pl. 16, figs. 370, 372) . . . . MEMBRÁCIDÆ
   Pronotum not prolonged over the base of the abdomen 5

5. Tibiæ smooth, the hind pair armed with one or two stout spines and with a cluster of spinules at apex; ocelli placed on the vertex, rarely absent. Spittle insects. (**Aphróphora, Clastóptera.**) . . . . CERCÓPIDÆ
   Hind tibiæ with a double series of spines beneath; ocelli variable in position, rarely absent. Leaf-hoppers 6

6. Veins of the fore wings branching on the disk so that they form a series of pre-apical cells 7
   Veins of the fore wings branching at the apex and passing without fork to the apical cells; ocelli usually absent. (**Typhlócyba** [*T. comes*, Grape leaf-hopper], **Empoásca** [*E. mali*, Apple leaf-hopper]) (Pl. 15, fig. 353).
   TYPHLOCÝBIDÆ

7. Head very short, vertex sloping or rounding on to the front; ocelli on the front. (**Bythóscopus, Idiócerus.**) . . . . BYTHOSCÓPIDÆ
   Head more or less prominent; ocelli placed on the disk of the vertex. (**Diedrocéphala, Tettigoniélla** (= *Tettigonia*), **Gýpona**) (Pl. 15, figs. 354, 357).
   (*TETTIGONIIDÆ*) PROCONÌIDÆ
   Head produced or rounded; ocelli on the margin between the vertex and front. (**Acocéphalus, Deltocéphalus, Thamnotéttix**) (Pl. 15, fig. 355) . . JÁSSIDÆ

8. Anal angle of wings net-veined; the ridge separating the front from the cheeks contiguous on the sides of the clypeus. (**Poiócera**) (Pl. 15, fig. 356).
   FULGÓRIDÆ
   Anal area of wings rarely net-veined, when so, the clypeus without lateral ridges 9

9. Hind tibiæ without a mobile spur at apex 10
   Hind tibiæ with a long, robust, mobile spur at apex. (**Libúrnia Stobæra**) (Pl. 15, fig. 359) . . . . DELPHÁCIDÆ

10. Clavus very rarely granulate, pointed at apex, rarely somewhat obtusely, but distinctly closed; two veins remote or very remote from the apex, sometimes united in one beyond the middle of the clavus; costa very rarely dilated; tegmina sometimes shortened or fused with clavus or corium 11
    Clavus granulate, apex sometimes subacute and closed, sometimes very obtuse and broadly open, with two veins separated through the entire length or united in one near apex; costa dilated; costal membrane transversely veined; claval suture distinct. (**Órmenis, Amphiscêpha, Chlorochrôa**) (Pl. 15, figs. 358, 361) . . . . FLÁTIDÆ

11. Claval vein not reaching apex, united with commisural margin near apex; tegmina sometimes shortened or fused with clavus and corium, when so, the lateral margins of the clypeus are ridged; two or three ocelli. (**Scòlops, Cíxius**) (Pl. 15, figs. 366, 367)............................**CIXÌIDÆ**
Claval vein continued to the apex itself or united with the claval suture near apex; tegmina sometimes shortened or fused with clavus and corium, when so the lateral margins of the clypeus are not ridged..................12

12. First joint of hind tarsi elongate; head usually narrower than the thorax, which is angularly emarginate at base..............................13
First joint of hind tarsi short, very rarely somewhat elongate; head not or scarcely narrower than the thorax which is truncate at base. (**Brucho-mórpha, Nàso.**)..**ÍSSIDÆ**

13. Last joint of beak elongate; species of usual form, the wings not especially long. (**Helicóptera.**)..**ACHÍLIDÆ**
Last joint of beak short, or very short; very delicate long-winged species. (**Otiócerus, Anòtia**) (Pl. 15, fig. 360)......................**DÉRBIDÆ**

14. Tarsi two-jointed, the basal joint sometimes reduced, the outer joint with two claws; wings when present four in number, with few veins, at rest usually lying in a sloping position over the abdomen; sutures between body segments distinct; mouth-parts usually well developed in both sexes, labium usually long..15
Tarsi one-jointed, with a single claw; females always wingless, often without legs so that they rarely move after maturity, remaining sessile on the host plant; female rarely without mouth-parts; male usually with a single pair of wings which lie flat, one above the other; labium usually short; antennæ of female absent, or with as many as eleven joints; in the male ten- to twenty-five-jointed; body of female scale-like, gall-like or covered with waxy powder, tufts or scales, the sutures between the segments often indistinct. Scale Insects, Bark-lice, Mealy-bugs. (**Orthèzia, Kérmes** [Soft oak-scales], **Dactylòpius** [*D. coccus*, Cochineal-insect], **Pseudocóccus** [Mealy-bugs], **Pulvinària** [*P. vitis*, Cottony-scale], **Cóccus** [*C. hesperidum*, Soft scale], **Eulecànium** [*E. nigrofasciatum*, Terrapin scale], **Chionàspis** [*C. furfura*, Scurfy scale], **Aspidiòtus** [*A. perniciosus*, San José scale], **Lepidósaphes** [*L. ulmi* (=*Mytilaspis pomorum*), Oyster-shell scale]) (Pl. 14, fig. 344, 346; Pl. 15, figs. 362, 363, 364, 365)......................**CÓCCIDÆ**

15. Legs with thickened femora; antennæ long, five- to ten-jointed, last joint with two fine apical bristles; fore wings somewhat thicker, often more or less leathery; pad between the tarsal claws prominent, bilobed. Jumping plant-lice. (**Psýlla** [*P. pyricola*, Pear Psylla], **Trìoza**) (Pl. 16, fig. 368, 371)..................................(*CHERMIDÆ*) **PSÝLLIDÆ**
Legs long and slender; wings of more or less similar consistency; antennæ three- to six-jointed...16

16. Wings usually opaque, whitish, clouded, or mottled with spots or bands; body more or less mealy; tarsi with two nearly equal joints; tip of tibiæ with a number of short spines; a pad-shaped or spine-like process between the

tarsal claws; pupal stage present. White-flies. (**Aleyrȍdes** [*A. vaporariorum*, Greenhouse white-fly], **Aleuródicus**) (Pl. 16, figs. 369, 375).
ALEYRÓDIDÆ

Wings transparent, though sometimes colored; tarsi two-jointed, the basal joint sometimes very much reduced; body not mealy but rarely with waxy wool; process between the tarsal claws absent or nearly so. Plant-lice. (**Phylloxèra** [*P. vastatrix*, Grape Phylloxera], **Àphis** [*A. brassicæ*, Cabbage Aphid; *A. gossypii*, Melon Aphid; *A. mali*, Apple Aphid; *A. sorbi*, Rosy Aphid], **Mýzus** [*M. cerasi*, Cherry Aphid; *M. ribis*, Currant Aphid], **Phórodon** [*P humuli*, Hop Aphid], **Nectaróphora** [*N.* (=*Macrosiphum*) *pisi*, Pea Aphid], **Toxóptera** [*T. graminum*, Grain Aphid]) (Pl. 16, figs. 373, 374).
APHÍDIDÆ

ORDER HEMIPTERA.

(*HETEROPTERA ; RHYNCHOTA*, part.)

Terrestrial or aquatic species ranging from minute to large size; usually more or less flattened or cylindrical; feeding on the juices of plants or animals. Head free, forming a sucking, inflexed, jointed beak which is usually inserted toward the front end of the head; antennæ with few joints, those of the terrestrial species usually long; prothorax large, free; wings overlapping on the abdomen, the fore pair (hemelytra) tough at the base and membranous apically, the hind pair with large anal field, wings sometimes reduced or absent; legs of variable form, tarsi normally three-jointed; no cerci. Metamorphosis incomplete. True Bugs.

1. Tarsal claws devoid of arolia, very rarely provided with arolia (Miridæ) in which case the meso- and metasternum are composite. 2
   Tarsal claws always provided with arolia; beak generally four-jointed; meso- and metasterna simple. 27

2. Antennæ very short; meso- and metasternum composite; metasternum devoid of gland openings; aquatic species. 3
   Antennæ always longer than the head, if slightly shorter, the eyes and ocelli are absent. 9

3. Ocelli present; beak four-jointed. 4
   Ocelli absent; antennæ more or less hidden in cavities in the head; aquatic species. 5

4. Antennæ exserted; front legs as long as the middle ones; formed for running. (**Óchterus** (=*Pelogonus*)). . . . . (*PELOGONIDÆ*) **OCHTÉRIDÆ**
   Antennæ hidden; the front legs formed for grasping; short and broad species with prominent eyes. (**Gelastócoris, Monónyx.**)
   (*GALGULIDÆ, MONONYCHIDÆ*) **NÉRTHRIDÆ**

5. Front coxæ placed at or near the front margin of the prosternum; front legs formed for grasping; beak three-jointed 6
   Front coxæ placed at the hind margin of the short prosternum; legs fitted for swimming; hind tarsi with no claws; membrane without veins; hemelytra sometimes wholly coriaceous, strongly convex 8

6. Membrane reticulate; beak provided with very small labial palpi 7
   Membrane without veins; beak without labial palpi; hind coxæ hinged; posterior tibiæ slender. (**Pelócoris, Ambr̀ysus.**) .... **NAUCÓRIDÆ**

7. Hind coxæ hinged; hind legs fitted for swimming; posterior tibiæ flattened and fringed, the hind femora usually sulcate; tip of abdomen with two retractile appendages. Giant water-bugs. (**Belóstoma, Lethócerus, Zàitha**) (Pl. 14, fig. 342) .... **BELOSTOMÁTIDÆ**
   Hind coxæ rotating; hind legs formed for walking; abdomen with long breathing tubes at apex. Water scorpions. (**Nèpa, Rânatra**) (Pl. 13, fig. 313; Pl. 14, fig. 324.) .... **NÉPIDÆ**

8. Body convex above; head inserted into prothorax; beak four- or three-jointed; front tarsi not flattened. Back swimmers. (**Notonécta**) (Pl. 14, fig. 323) .... **NOTONÉCTIDÆ**
   Body flat above; vertex of head free from the prothorax; beak unjointed, or at most two-jointed, hidden; metasternum furnished with parapleuræ; front tarsi flattened, one-jointed, middle legs long, hind legs formed for swimming. Water boatmen. (**Coríxa**) (Pl. 13, fig. 322; Pl. 14, figs. 328, 329) .... **CORÍXIDÆ**

9. First two joints of antennæ very short, last two long, pilose, the third thickened at base; ocelli present; veins of the hemelytra forming cells 10
   Third joint of antennæ not thickened at the base, the second joint often longer than the third or as long, rarely shorter 11

10. Head more or less porrect. (**Ceratocómbus**) (*CERATOCOMBIDÆ*). **DIPSOCÓRIDÆ**
    Head inflexed between the prominent front coxæ. (**Hypselosòma** (=*Glyptocómbus*) .... **SCHIZOPTÉRIDÆ**

11. Meso- and metasterna composite, very rarely the sutures obsolete, in which case the clypeus is triangular (Cimicidæ); cuneus of the fully winged forms more or less distinct; hind coxæ hinged (except in a few Miridæ) 12
    Meso- and metasterna simple; hind coxæ nearly globose, rotating with a ball and socket joint (except in Acanthiidæ) 15

12. Clypeus parallel or subparallel 13
    Clypeus triangular, broader apically; ocelli absent; wings never fully developed. Bedbug family. (**Cìmex** [*C. lectularius*, Bedbug]) (Pl. 13, fig. 321; Pl. 14, fig. 330) (*ACANTHIIDÆ* of authors, *CLINOCORIDÆ*) .. **CIMÍCIDÆ**

13. Ocelli of both sexes absent; tarsi three-jointed; beak four-jointed; membrane with two basal cells, the outer one small, or with a single cell which is broadened apically or rarely suboval, very rarely (Myrmecophyes) with irregular, free veins; beak with the first joint rarely shorter than the head. Leaf-

bugs. (**Lŷgus** [*L. pratensis*, Tarnished plant bug], **Hálticus, Pœcilocápsus**) (Pl. 14, fig. 325.) (*CAPSIDÆ.*)........................**MÍRIDÆ**
Ocelli present; tarsi three-jointed..................................14

14. Beak four-jointed; head vertical; membrane with one or two cells or one vein. (**Isometòpus.**)....................................ISOMETÓPIDÆ
Beak three-jointed; head horizontal; membrane with four to one longitudinal veins which are rarely entirely lacking. (**Anthócoris, Trìphleps** [*T. insidiosus*, Predatory flower-bug]) (Pl. 14, fig. 337).........**ANTHOCÓRIDÆ**

15. Claws subapical; hind coxæ distant; hemelytra of uniform texture, the clavus, corium and membrane confluent................................16
Claws apical..17

16. Beak four-jointed, but the first joint short; middle and hind legs close together, distant from the front ones and much longer than the latter. Water striders. (**Gérris** (= *Limnotréchus*)) (Pl. 14, fig. 327) *HYDROBATIDÆ*.......................................**GÉRRIDÆ**
Beak three-jointed; middle legs almost as distant from the front as from the hind ones. (**Microvèlia, Rhagovèlia.**).......................**VELÌIDÆ**

17. Prosternum without a stridulation groove............................18
Prosternum with a median stridulation groove; beak three-jointed, short and stout..25

18. Ocelli absent; beak three-jointed....................................19
Ocelli present, when very rarely absent, the beak is four-jointed and the head is not apically widened.......................................22

19. Tarsi three- or four-jointed 20
Tarsi two-jointed; broad, flat species living under bark; head produced between antennæ; abdomen broader than the wings..........................21

20. Body linear; head horizontal, as long as the thorax and widened toward the apex. Marsh treaders. (**Hydrómetra** (= *Limnobates*)) (Pl. 14, fig. 326). (*LIMNOBATIDÆ*)............................**HYDROMÉTRIDÆ**
Body oblong; head broad, triangular, shorter than thorax; eyes absent; no scutellum; hemelytra short, destitute of membrane; parasitic on bats. (**Hesperóctenes**) (Pl. 14, fig. 333)....................**POLYCTÉNIDÆ**

21. Head not wide behind the eyes which are prominent; beak longer than the head; trochanters very short, fusing with the femora; abdominal spiracles placed near the base of the segments. (**Áradus**) (Pl. 14, fig. 335). **ARÁDIDÆ**
Posterior part of head wide, enclosing the eyes, often spinose, beak rarely longer than the head; trochanters distinct; abdominal spiracles remote from the base of the segments. (**Aneùrus, Mezìra.**)......**DYSODÌIDÆ**

22. Beak four-jointed, with the first joint small; last joints of the antennæ more slender; membrane with two or three longitudinal cells emitting radiating veins. (**Reduvìolus, Págasa.**)............................**NÁBIDÆ**
Beak three-jointed 23

23. Head not constricted at the base behind the eyes....................24
Head constricted at the base and behind the eyes, swollen between; pronotum divided into three lobes; hemelytra wholly membranous, provided with longitudinal veins and a few crossveins; front tibiæ swollen; front tarsi one-jointed, hind tarsi two-jointed. (**Henicocèphalus**) (Pl. 14, fig. 336). **HENICOCEPHÁLIDÆ**

24. First joint of antennæ longer than the second; hemelytra with submembranaceous corium with elevated veins, the clavus and membrane membranaceous, confluent, the latter destitute of veins. (**Mesovèlia.**) **MESOVELÌIDÆ**
First joint of antennæ shorter than the second; hemelytra with distinct clavus, corium and membrane, the latter with *four or five contiguous longitudinal* cells; eyes large and projecting; small, flattened forms. Shore-bugs. (**Acánthia** (=*Salda*).) (Pl. 13, fig. 315.)....(*SALDIDÆ*) **ACANTHÌIDÆ**

25. Antennæ elbowed, filiform or often slender apically; membrane with two or three large basal cells.......................................26
Last joint of antennæ knobbed or enlarged in the middle; membrane with the veins joined, frequently forked and uniting; tarsi two-jointed; front legs formed for grasping, the femora much thickened. (**Phymàta.**) (*PHYMATIDÆ*) **MACROCEPHÁLIDÆ**

26. Rather robust, predatory species, body not linear. Assassin bugs. (**Melanolêstes** [*M. picipes*, Kissing bug], **Conorhìnus** [*C. sanguisugus*, Big Bedbug], **Sìnea**) (Pl. 13, figs. 316, 193; Pl. 14, fig. 338)...........**REDUVÌIDÆ**
Linear species with excessively long and thin legs. (**Émesa.**)..**EMÉSIDÆ**

27. Head not shield-like, the margins usually obtuse; antennæ completely visible from above..28
Head more or less expanded, the side margins acute in front of the eyes; at least the first joint of the antennæ not visible from above; membrane with several veins...36

28. *Antennæ five-jointed*, the second joint short; clavus membranous, largely confluent with the membrane which is destitute of veins; tarsi two-jointed. (**Næogêus.**)..........................(*HÉBRIDÆ*) **NÆOGÈIDÆ**
Antennæ four-jointed...29

29. Ocelli absent..30
Ocelli present...31

30. Hemelytra of the fully winged forms consisting of clavus, corium and membrane; beak free; tarsi three-jointed; stout bugs of moderate size. (**Dysdércus** [*D. suturellus*, Cotton Stainer])..............**PYRRHOCÓRIDÆ**
Hemelytra wholly membranous, densely reticulated; cheeks entirely raised, forming a groove which includes the base of the beak; *tarsi two-jointed;* flat bugs of small size. Lace-bugs, (**Corythùca** [*C. arcuata*, Hawthorn Lace-bug]) (Pl. 14, fig. 340)...........................**TINGÍTIDÆ**

31. Membrane with many longitudinal veins which often unite; antennæ inserted well up on the sides of the head....................................32
Membrane with at most five veins..................................34

32. Fourth dorsal segment of abdomen constricted medially; gland openings of metathorax usually obsolete, if rarely visible placed between the hind coxal cavities and emitting two divergent grooves. (**Corízus, Harmóstes**) (Pl. 14, fig. 331) . . . . **CORÍZIDÆ**

Basal margin of fourth and fifth dorsal segments usually sinuate in parallel manner; gland openings of metathorax almost always distinct 33

33. Head much narrower and shorter than the prothorax, cheeks usually reaching behind insertion of antennæ; exterior margin of hind coxal cavities nearly parallel with axis of body. (**Ánasa** [*A. tristis*, Squash-bug], **Leptoglóssus** [*L. phyllopus*, Leaf-footed Bug], **Leptócoris** [*L. trivittatus*, Box-elder plant-bug]) (Pl. 13, figs. 317, 318, 320; Pl. 14, figs. 334, 341) . . . . **CORÈIDÆ**

Head nearly as broad and long as prothorax, cheeks scarcely extending behind base of antennæ; exterior margin of hind coxal cavities more or less transverse. (**Álydus, Stachyocnèmus.**) . . . . **ALÝDIDÆ**

34. Anterior lobes of the head produced at the apex; membrane of the fully winged forms usually with four free veins and coriaceous at the base; tarsi two-jointed. (**Piésma.**) . . . . **PIÉSMIDÆ**

Anterior lobes of the head not produced; membrane of the fully winged forms entirely membranous; tarsi three-jointed 35

35. Antennæ not elbowed; head not constricted in front of the eyes. (**Blíssus** [*B. leucopterus*, Chinch-bug], **Oncopéltus, Geócoris**) (Pl. 14, fig. 343). (*LYGÆIDÆ*) **MYODÓCHIDÆ**

Antennæ elbowed, the first joint long and clubbed, the last joint spindle-shaped; head constricted in front of the eyes; scutellum small; femora clubbed. Stilt Bugs. (**Jálysus, Nèides.**) . . . . (*BERYTIDÆ*) **NEÍDIDÆ**

36. Scutellum narrowed behind, rarely almost covering the abdomen; veins of membrane arising near inner basal angle from a vein extending from this angle nearly parallel with the margin of the corium. Stink bugs. (**Cosmopépla, Euschístus, Murgántia** [*M. histrionica*, Harlequin Cabbage-bug], **Perïbalus, Brochymèna.**) (Pl. 13, fig. 314; Pl. 14, fig. 332.) **PENTATÓMIDÆ**

Scutellum very convex and large, nearly or quite covering the abdomen; membrane with a curved or oblique crossvein whose inner end extends away from the corium; hind wings with a heavy abrupt spur-like vein (hamus) 37

37. Corium narrow, and pointed; tibiæ strongly spinose; (**Thyreócoris** (= *Corimelæna*), **Cýdnus**) (*CORIMELÆNIDÆ, CYDNIDÆ*) . . **THYREOCÓRIDÆ**

Corium broad, obtuse at apex; tibiæ smooth or with small spinules. (**Eurygáster, Homæmus.**) . . . . **SCUTELLÉRIDÆ**

CLASS THYSANURA.

Rather small, wingless, terrestrial insects of active habits; body generally clothed with scales; antennæ hair-like, many-jointed; abdomen composed of eleven segments, the last furnished with a pair of long, filiform many-jointed cerci and usually with

a similar and long median cerciform appendage; the second to the seventh ventral segments with single-jointed, marginal styles and eversible sacs; eighth and ninth ventral segments of female with paired short, conical, egg-laying appendages; mouthparts free, their tips visible.

ORDER LEPISMATOIDEA.

(*ZYGENTOMA.*)

Rather small, very active, wingless, terrestrial forms, with the body narrow, flattened and gradually attenuated posteriorly; body always clothed with scales; eyes small, not approximate; consisting of separated ocelli; tergites weakly developed, but the pleurites and sternites strongly so; prothorax as large and usually much larger than the mesothorax; tarsi two-jointed; two pairs of thoracic and eight pairs of abdominal spiracles; no power of springing.

(Lepísma [*L. saccharina*, Bristle-tail), Gastrothêus].) (Pl. 16, figs. 378, 387).
LEPISMÁTIDÆ

ORDER MACHILOIDEA.

(*ARCHEOGNATHA.*)

Rather small active wingless, terrestrial forms, with the body convex above and somewhat compressed, gradually tapering posteriorly; body clothed with scales; eyes very large, meeting or nearly so; tergites strongly developed, extending to the under side of the body, the pleurites and sternites greatly reduced; prothorax smaller than the mesothorax; tarsi three-jointed; two pairs of thoracic and seven pairs of abdominal spiracles; insects capable of springing.

(Máchilis.)...MACHÍLIDÆ

CLASS CAMPODEOIDEA.

(*DIPLURA.*)

Small, slender, wingless insects incapable of springing and of sluggish habits; body never clothed with scales; antennæ usually many jointed; eyes absent; abdomen consisting of eleven segments, the last segment either more or less covered by the preceding or fused with it; no ventral tube, but the first to the seventh or

the second to the seventh segments are provided with ventral styles; apex of abdomen without median process, but with paired cerci; mouthparts partly concealed within the head, but the palpi extended; tarsi one-jointed; no metamorphosis.

ORDER RHABDURA.

Very thinly chitinized, small, slender, terrestrial insects with somewhat flattened body; abdomen ending in long, or rather long, jointed cerci.

1. Occiput of the head small and hardly distinct from the vertex; first ventral segment with four posterior processes; cerci short, robust, six-jointed, perforated at apex; ten spiracles. (Anajápyx) (Pl. 16, fig. 386). PROJAPÝGIDÆ

   Occiput rather large and distinct from the vertex; first ventral segment with two posterior processes; cerci long, slender and apically imperforate; three spiracles. (Campòdea.) (Pl. 16, fig. 279.)..............CAMPODÈIDÆ

ORDER DICELLURA.

(*URATOCHEILA.*)

Rather delicate terrestrial insects with somewhat flattened body, the abdomen ending in a pair of strong one-jointed forceps; first ventral segment with two short styles and two submedian hairy papillæ.

(Jápyx) (*Pl.* 16, figs. 382, 383)..............................JAPÝGIDÆ

CLASS COLLEMBOLA.

Minute, wingless, springing insects; body sometimes clothed with scales; abdomen consisting of six segments and never terminated by caudal filaments or pincers-like appendages; ventral tube always present; a forked leaping appendage usually present beneath the abdomen. Eyes of degenerate compound type; palpi vestigial; antennæ with four to six joints; tarsi one-jointed; no metamorphosis.

ORDER ARTHROPLEONA.

Body lengthened, subcylindrical; the abdomen composed of six free segments, the fourth segment often much lengthened; heart with six pairs of ostioles.

1. Furcula wanting; body naked or hairy, never with scales; antennæ four-jointed, often poorly-developed; claws two or one; sluggish species. (**Anùrida, Neanùra**) (*ANURIDIDÆ*)........................**APHORÙRIDÆ**
   Furcula present..2
2. Furcula attached to the penultimate abdominal segment; body sometimes clothed with scales; antennæ four- to six-jointed; claws two. (**Isótoma, Orchesélla, Tomócerus**) (Pl. 16, figs. 380, 381).
   (*DEGEERIIDÆ*) **ENTOMOBRŶIDÆ**
   Furcula attached to the antepenultimate abdominal segment; body without scales; antennæ four-jointed; claws two or one. (**Podùra, Achorùtes.**)
   (*ACHORUTIDÆ*) **PODÙRIDÆ**

ORDER SYMPHYPLEONA.

Body shortened; abdomen globose, its segments in part fused; head usually vertical; ventral tube always long and well developed, usually with two long, exsertile filaments; furcula well developed; no post antennal organ; heart with two pairs of ostioles.

1. Last joint of the antennæ long, usually divided into false ring joints (**annuli**); upper claw unindentate. (**Sminthùrus.**) (Pl. 16, fig. 384).
   SMINTHÙRIDÆ
   Last joint of antennæ short, not ringed..................................2
2. Last joint of antennæ with whorls of hairs; the distal part of the third joint annulate; head vertical; filaments of ventral tube long; thorax shorter than the abdomen. (**Papírius.**)..............................**PAPIRÌIDÆ**
   Distal joints of antennæ simple; head horizontal; filaments of ventral tube represented by two rounded tubercles; thorax longer than the abdomen. (**Neèlus, Megalothòrax.**)..........(*MEGALOTHORACIDÆ*) **NEÈLIDÆ**

CLASS MIRIENTOMATA.

Minute, delicate, wingless, terrestrial, blind species. Body bare; antennæ absent, abdomen comprising eleven segments and a short anal tube, the basal three segments furnished with styles; no cerci; mouthparts, formed for sucking, but retracted within the head.

ORDER PROTURA.

Slender, head pear-shaped, labrum medially narrowed to a beak, mandibles long and slender; prothorax short; legs short, tarsi one-jointed.

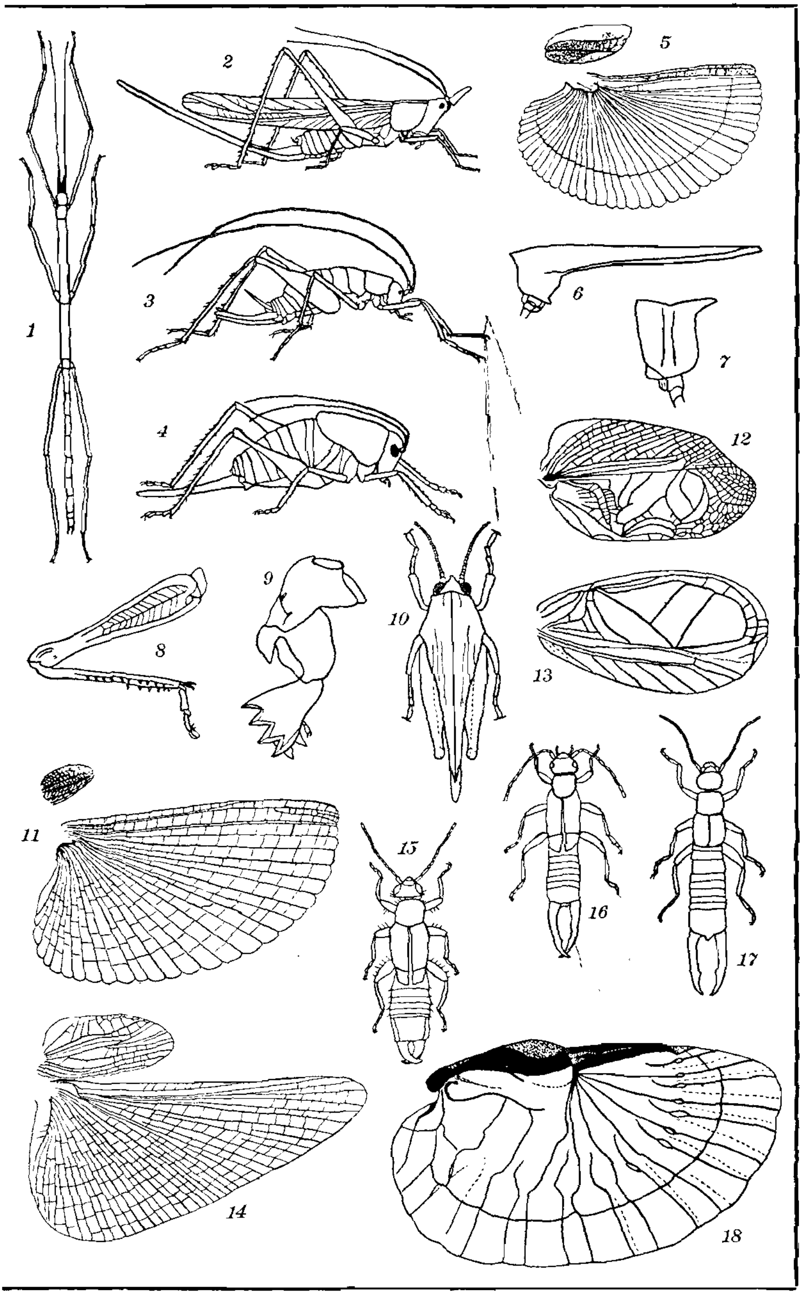
(**Eosèntomon**) (Pl. 16, fig. 385)........................ **EOSENTÓMIDÆ**

EXPLANATION OF PLATES.

PLATE 1.

Phasmoidea, Orthoptera, Dermaptera.

1. **Pseudomeryle.** (Caudell) [Phasmidæ]
2. **Conocephalus.** (Blatchley) [Locustidæ]
3. **Ceuthophilus.** (Blatchley) [Locustidæ]
4. **Anabrus.** (Caudell) [Locustidæ]
5. **Tridactylus,** wings. (Handlirsch) [Tridactylidæ]
6. **Tettix,** side view of pronotum. (Packard) [Tettigidæ]
7. **Caloptenus,** side view of pronotum. (Packard) [Acridiidæ]
8. **Acridium,** hind leg. (Lugger) [Acridiidæ]
9. **Gryllotalpa,** front leg. (Berlese) [Gryllotalpidæ]
10. **Tettigidea.** (Blatchley) [Tettigidæ]
11. **Tettix,** wings. (Handlirsch) [Tettigidæ]
12. **Gryllus,** fore wing. (Handlirsch) [Gryllidæ]
13. **Œcanthus,** fore wing. (Handlirsch) [Gryllidæ]
14. **Gryllotalpa,** wings. (Handlirsch) [Gryllotalpidæ]
15. **Propyragra.** (Burr) [Pygidicranidæ]
16. **Doru.** (Burr) [Forficulidæ]
17. **Labidura.** (Burr) [Labiduridæ]
18. Hind wing of Earwig. [Forficulidæ]



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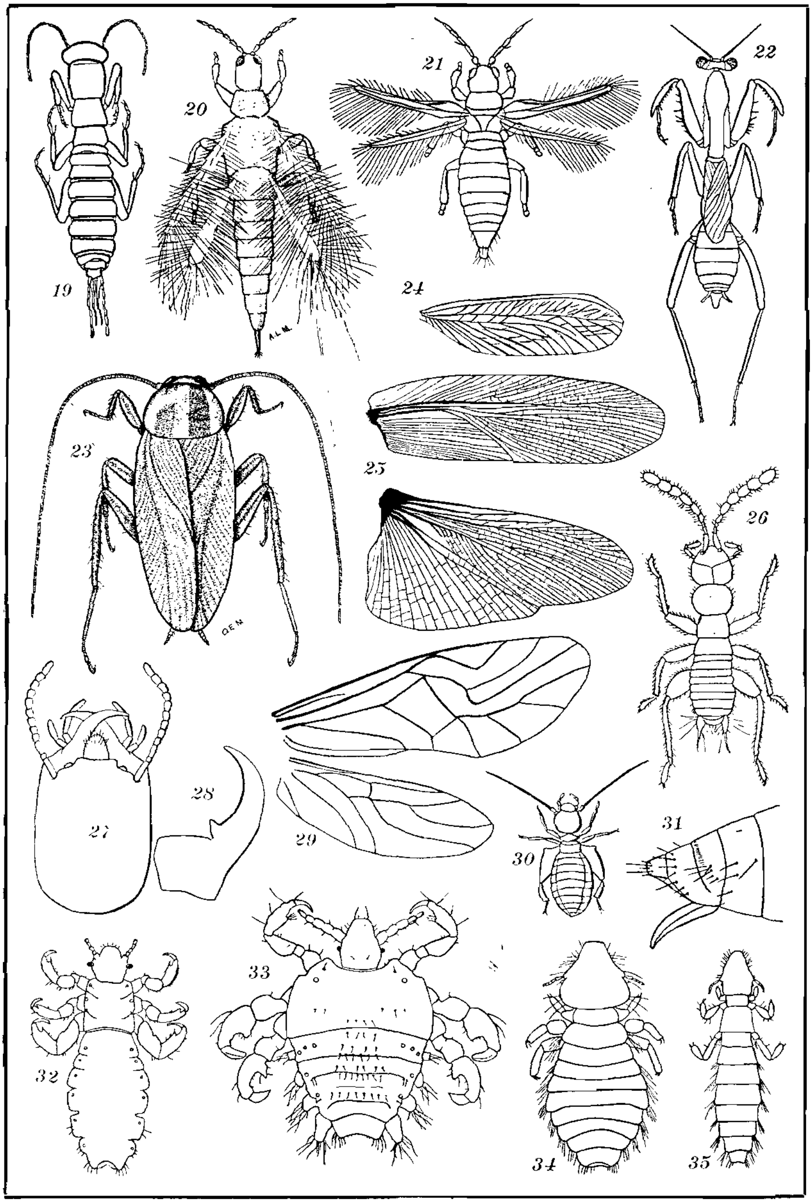
PHASMOIDEA, ORTHOPTERA, DERMAPTERA.

PLATE 2.

Grylloblattoidea, Thysanoptera, Mantoidea, Blattoidea, Zoraptera, Isoptera, Corrodentia, Siphunculata, Mallophaga.

19. **Grylloblatta.** (Walker) [Grylloblattidæ]
20. **Thrips.** [Thripidæ]
21. **Heliothrips.** (Russell) [Thripidæ]
22. **Stagmomantis.** (Rehn & Hebard) [Mantidæ]
23. **Blatella.** [Blattidæ]
24. **Termes,** wing. (Handlirsch) [Termitidæ]
25. **Blatta,** wings. [Blattidæ]
26. **Zorotypus.** (Silvestri) [Zorotypidæ]
27. **Eutermes,** head. [Termitidæ]
28. **Eutermes,** mandible. [Termitidæ]
29. **Psocus,** wings. (Comstock & Needham) [Psocidæ]
30. **Troctes.** (Marlatt) [Atropidæ]
31. **Euthrips,** tip of abdomen showing ovipositor. (Russell) [Thripidæ]
32. **Pediculus.** (Patton & Cragg) [Pediculidæ]
33. **Phthirius.** (Patton & Cragg) [Pediculidæ]
34. **Docophorus.** (Paine) [Philopteridæ]
35. **Lipeurus.** (Paine) [Philopteridæ]

PLATE 2.



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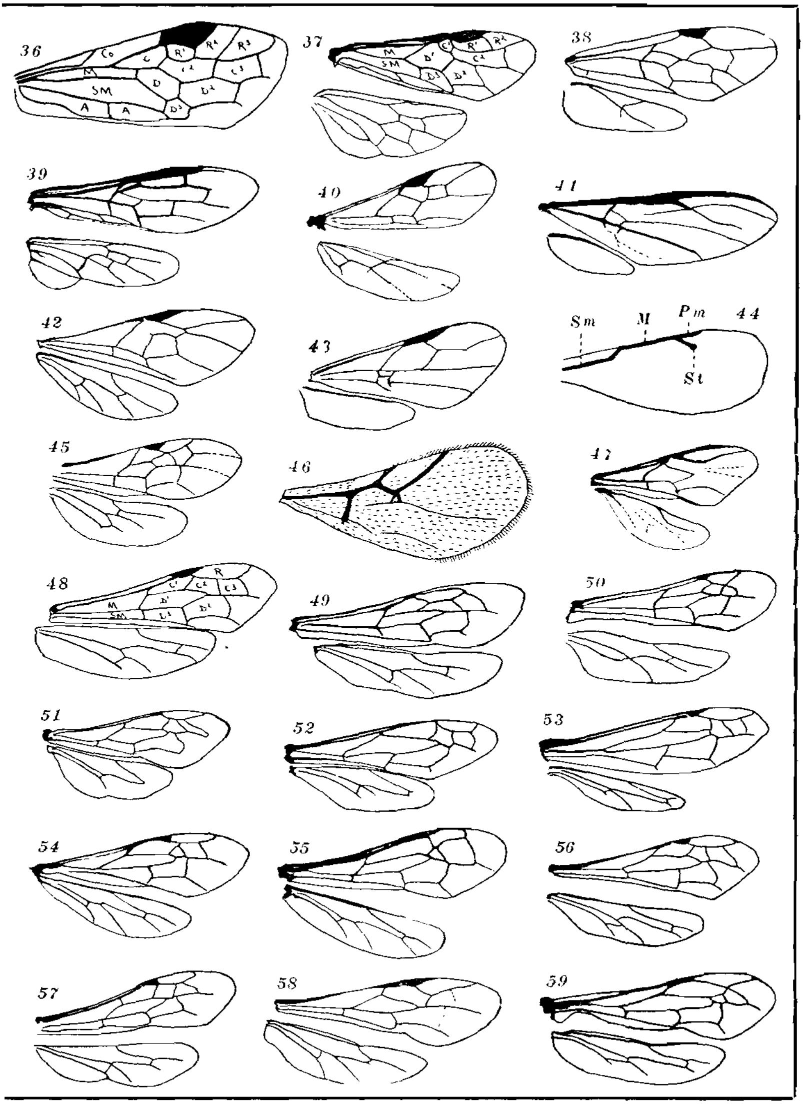
GRYLLOBLATTOIDEA, THYSANOPTERA, MANTOIDEA, BLATTOIDEA, ZORAPTERA, ISOPTERA, CORRODENTIA, SIPHUNCULATA, MALLOPHAGA.

PLATE 3.

Hymenoptera.

36. **Xyela**, *fore wings.* (Macgillivray) [Xyelidæ]
37. **Dolerus**, wings. [Tenthredinidæ]
38. **Aulacus**, wings. [Evaniidæ]
39. **Tremex**, wings. [Siricidæ]
40. **Rhogas**, *wings.* [*Braconidæ*]
41. **Pelecinus**, wings. [Pelecinidæ]
42. **Ophion**, wings. [Ichneumonidæ]
43. **Fœnus**, wings. [Evaniidæ]
44. Chalcidoidea, fore *wing* (diagrammatic) Sm. submarginal vein; **M, marginal** vein; Pm, postmarginal vein; St, stigmal vein. [Chalcididæ]
45. **Sphærophthalma**, wings. [Mutillidæ]
46. Cynipoidea, fore wing. (diagrammatic) (Kieffer)
47. **Chrysis**, *wings.* [*Chrysididæ*]
48. **Myzine**, wings of male. [Myzinidæ]
49. **Myzine**, wings of female. [Myzinidæ]
50. **Psammochares**, wings. [Psammocharidæ]
51. **Tachytes**, wings. [*Larridæ*]
52. **Bembex**, wings. [Bembecidæ]
53. **Vespa**, wings. [Vespidæ]
54. **Cerceris**, wings. [Philanthidæ]
55. **Eucerceris**, *wings.* [*Philanthidæ*]
56. **Gorytes**, wings. [Gorytidæ]
57. **Isodontia**, wings. [Sphegidæ]
58. **Trypoxylon**, wings. [Trypoxylonidæ]
59. **Eumenes**, *wings.* [*Eumenidæ*]



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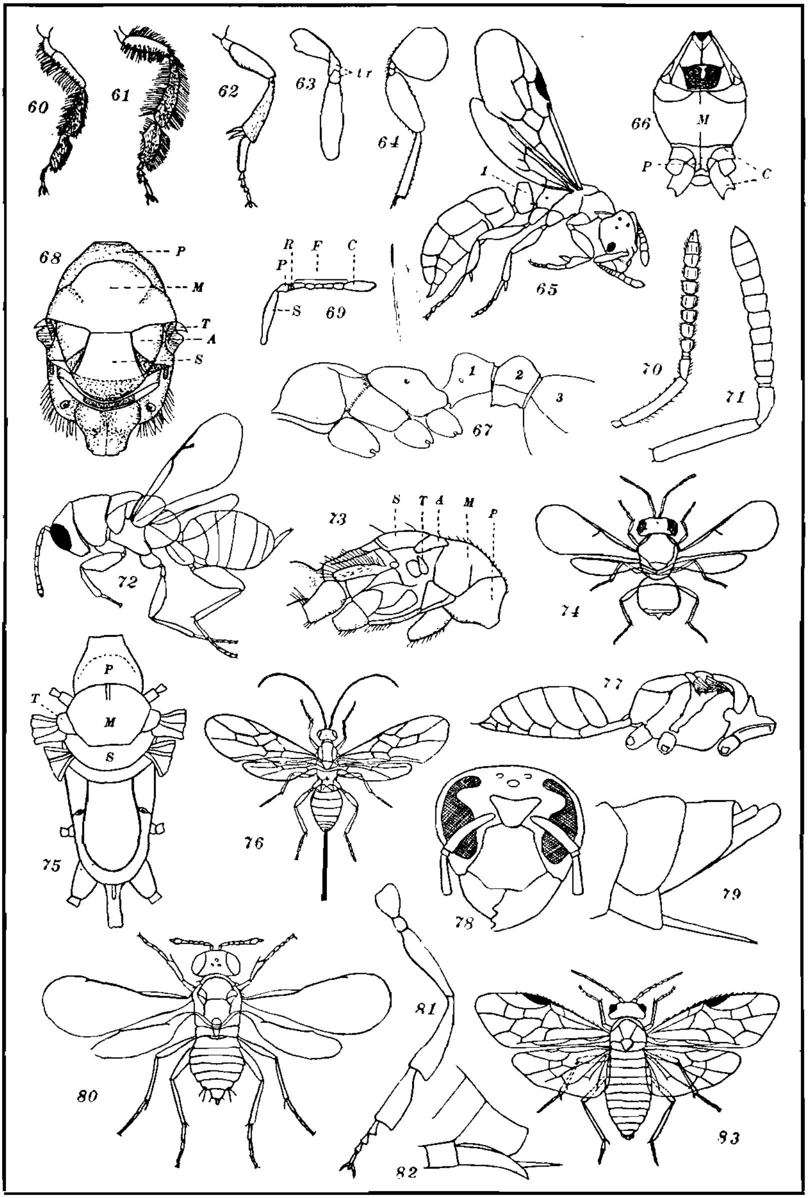
HYMENOPTERA.

PLATE 4.

Hymenoptera.

60. Hind leg of bee. (Riley)
61. Hind leg of bee. (Riley)
62. Hind leg of bee. (Riley)
63. **Ichneumon**, basal segments of leg; tr. two-jointed trochanter. (Sharp) [Ichneumonidæ]
64. **Elasmus**, basal segments of leg; tr., two-jointed trochanter (Silvestri) [Elasmidæ]
65. **Ponera**, winged ♀; 1, node or basal segment of abdomen. (Wheeler) [Formicidæ]
66. **Tachytes**, underside of thorax; M., mesosternum; P., its posterior process; C., coxæ. (Williams) [Larridæ]
67. **Myrmica**, thorax and basal segments of abdomen; 1, 2, 3, first three abdominal segments. (Wheeler) [Formicidæ]
68. **Pteromalus**, thorax from above; P., pronotum; M., mesonotum; T., tegula; A., axilla; S., scutellum. [Pteromalidæ]
69. **Chalcidoidea**, diagram of antenna; P., pedicel; R., ring-joints; F., funicle; C., club.
70. **Dibrachys**, antenna of female. [Pteromalidæ]
71. Same, male. [Pteromalidæ]
72. **Bephratoides.** (Brues) [Eurytomidæ]
73. **Eulophus**, thorax from side. (Silvestri) Lettering as in fig. 68. [Eulophidæ]
74. **Telenomus.** [Scelionidæ]
75. **Chlorion**, thorax from above. (Fernald) Lettering as in fig. 68. [Sphecidæ]
76. **Bracon.** (Hunter & Hinds) [Braconidæ]
77. **Chlorion**, lateral view of thorax and abdomen. (Fernald) [Sphecidæ]
78. **Vespa**, head from front. (Schmiedeknecht) [Vespidæ]
79. **Ichneumon**, apex of abdomen with ovipositor. [Ichneumonidæ]
80. **Coccophagus.** (Howard) [Eulophidæ]
81. **Apis**, hind leg. (Smith) [Apidæ]
82. **Epeolus**, apex of abdomen, with sting. (Brues) [Melectidæ]
83. **Cladius.** (Chittenden) [Tenthredinidæ]



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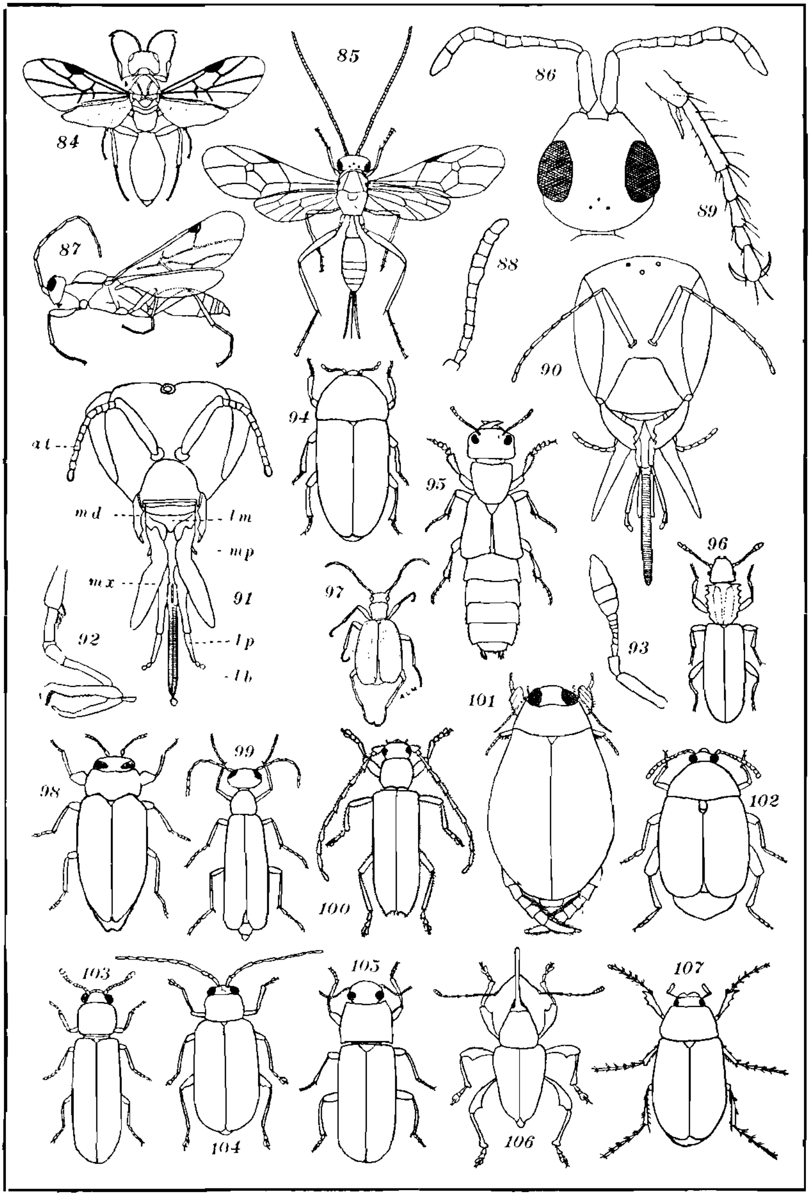
HYMENOPTERA.

PLATE 5.

Hymenoptera, Coleoptera.

84. **Vanhornia.** (Crawford) [Vanhorniidæ]
85. **Cryptus.** [Ichnuemonidæ]
86. **Ceraphron,** head. [Ceraphronidæ]
87. **Serphus.** (Brues) [Serphidæ]
88. **Niteliopsis,** antenna of female. (Williams) [Larridæ]
89. **Larropsis,** front tarsus of female. (Williams) [Larridæ]
90. Head of long-tongued bee. (Cockerell)
91. **Apis,** head. (Chesire) at, antenna; md., mandible; lm., labrum; mx., maxillary palpus; lp., labial palpus, lb., labium. [Apidæ]
92. **Gonatopus,** front tarsus of female. [Dryinidæ]
93. **Loxotropa,** antenna. [Diapriidæ]
94. **Dermestes.** (Howard & Marlatt) [Dermestidæ]
95. **Staphylinus.** [Staphylinidæ]
96. **Silvanus.** (Chittenden) [*Cucujidæ*]
97. **Brachinus.** [Carabidæ]
98. **Chrysobothris.** (Chittenden) [Buprestidæ]
99. **Epicauta.** (Bruner) [Meloidæ]
100. **Elaphidion.** (Forbes) [Cerambycidæ]
101. **Cybister.** (Maxwell-Lefroy) [Dytiscidæ]
102. **Bruchus.** (Felt) [Bruchidæ]
103. **Lyctus.** (Hopkins) [Lyctidæ]
104. **Diabrotica.** (Chittenden) [Chrysomelidæ]
105. **Tenebrio.** (Girault) [Tenebrionidæ]
106. **Balaninus.** (Chittenden) [Curculionidæ]
107. **Lachnosterna.** (Forbes) [Scarabæidæ]



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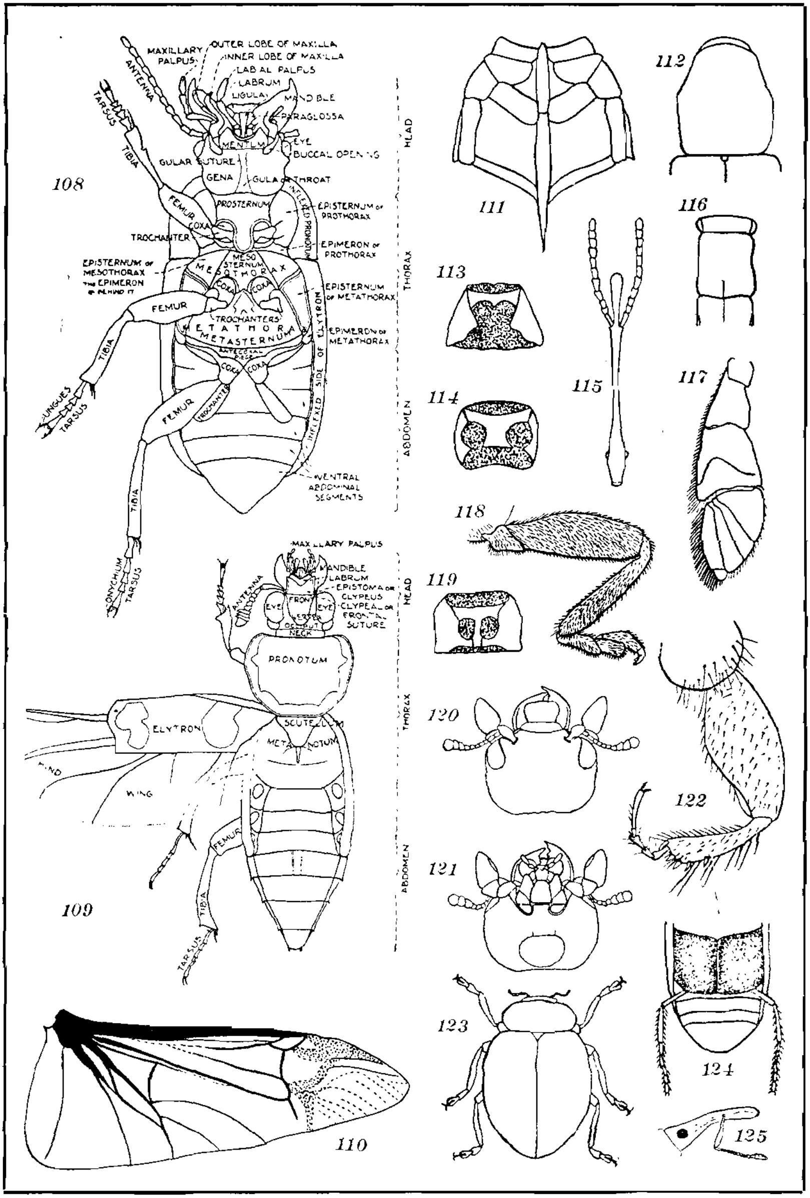
HYMENOPTERA, COLEOPTERA.

PLATE 6.

Coleoptera.

108. **Harpalus**, underside. (Hayward) [Carabidæ]
109. **Necrophorus**, upper side, wings spread on left side and removed on right. (Hayward) [Silphidæ]
110. **Hydrophilus**, wing. [Hydrophilidæ]
111. **Hydrophilus**, mesosternum. (Berlese) [Hydrophilidæ]
112. **Hylastes**, dorsal outline of head and prothorax. (Felt) [Ipidæ]
113. Prosternum of beetle, showing coxal cavities confluent and open behind. [Wickham]
114. Prosternum of beetle, showing coxal cavities separated and open behind. [Wickham]
115. **Brenthus**, head from above. (Berlesse) [Brenthidæ]
116. **Platypus**, dorsal outline of head and prothorax. (Felt) [Platypodidæ]
117. **Gyrinus**, hind leg. (Berlese) [Gyrinidæ]
118. **Epilachna**, hind leg. (Silvestri) [*Coccinellidæ*]
119. Prosternum of beetle, showing coxal cavities separated and closed behind. [Wickham]
120. **Epilachna**, head from above. [Silvestri] [Coccinellidæ]
121. **Epilachna**, head from below. (Silvestri) [Coccinellidæ]
122. **Pityogenes**, front leg. (Felt) [Ipidæ]
123. **Coccinella**. [Coccinellidæ]
124. **Haliplus**, c, coxal plate. (Maxwell-Lefroy) [Haliplidæ]
125. **Curculionidæ**, side view of head.



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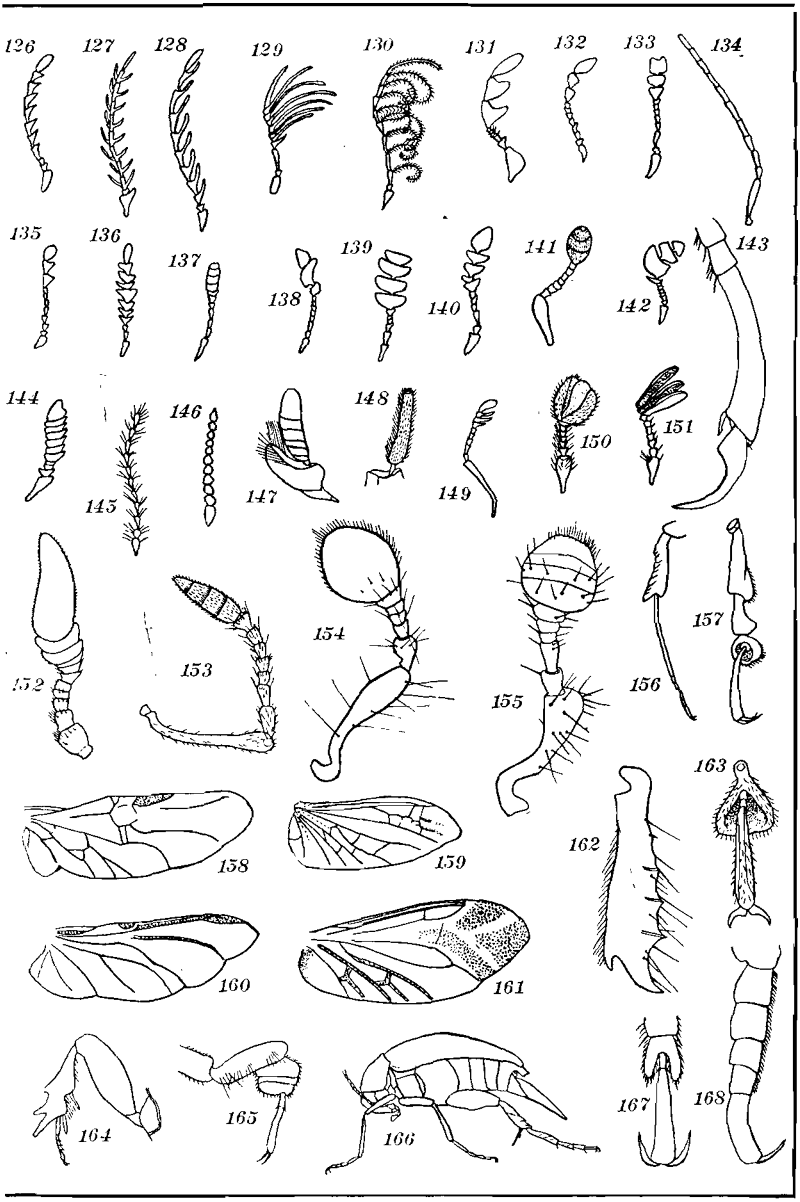
COLEOPTERA.

PLATE 7.

Coleoptera.

126. **Ludius,** antenna. [Elateridæ]
127. **Prionocyphon,** antenna. [Helodidæ]
128. **Corymbites,** antenna. [Elateridæ]
129. **Acneus,** antenna. [Helodidæ]
130. **Dendroides,** antenna. [Pyrochroidæ]
131. **Dorcatoma,** antenna. [Anobiidæ]
132. **Aulicus,** antenna. [Cleridæ]
133. **Corynetes,** antenna. [Corynetidæ]
134. **Brontes,** antenna. [Cucujidæ]
135. **Temnochilus,** antenna. [Ostomatidæ]
136. **Catoptrichus,** antenna. [Silphidæ]
137. **Colon,** antenna. [Silphidæ]
138. **Bryaxis,** antenna. [Pselaphidæ]
139. **Anogdus,** antenna. [Silphidæ]
140. **Liodes,** antenna. [Silphidæ]
141. **Epierus.** antenna. [Histeridæ]
142. **Phymaphora,** antenna. [Mycetæidæ] (Figs. 126–142 from Leconte & Horn)
143. **Macronychus,** apical portion of tarsus. [Parnidæ]
144. **Heterocerus,** antenna. [Heteroceridæ]
145. **Dasycerus,** antenna. [Lathridiidæ]
146. **Rhysodes,** antenna. [Rhysodidæ]
147. **Dineutes,** antenna. [Gyrinidæ]
148. **Adranes,** antenna. [Pselaphidæ]
149. **Lucanus,** antenna. [Lucanidæ]
150. **Bolbocerus,** antenna. [Scarabæidæ]
151. **Lachnosterna,** antenna. (Scarabæidæ] (Figs. **144-151 from Leconte & Horn)**
152. **Anthrenus,** antenna. (Felt) [Dermestidæ]
153. **Sitones,** antenna. (Silvestri) [Curculionidæ]
154. **Ips,** antenna. (Felt) [Ipidæ]
155. **Dendroctonus,** antenna. (Felt) [Ipidæ]
156. **Platypus,** tibia and tarsus of front leg. (Felt) [Platypodidæ]
157. **Leptinotarsa,** tarsus. (Sharp) [Chrysomelidæ]
158. **Tachypus,** wing; illustrating type 1 of wing venation in Coleoptera. **(Kem**pers) [Carabidæ]
159. **Omma,** wing; illustrating type 1, (Kempers) [Ommadidæ]
160. **Necrophorus,** wing; illustrating type 2. (Kempers) [Silphidæ]
161. **Lygistopterus,** wing; illustrating type 3. (Kempers) [Lycidæ]
162. **Erineophilus,** front tibia. (Felt) [Ipidæ]
163. **Adimerus,** tarsus. (Sharp) [Adimeridæ]
164. **Scarites,** front leg. (Kolbe) [Carabidæ]
165. **Dytiscus,** front tibia and tarsus of male. (Kolbe) [Dytiscidæ]
166. **Mordellistena.** [Mordellidæ]
167. **Saperda,** apical part of tarsus. [Cerambycidæ]
168. **Megalodachne,** tarsus. [Erotylidæ]



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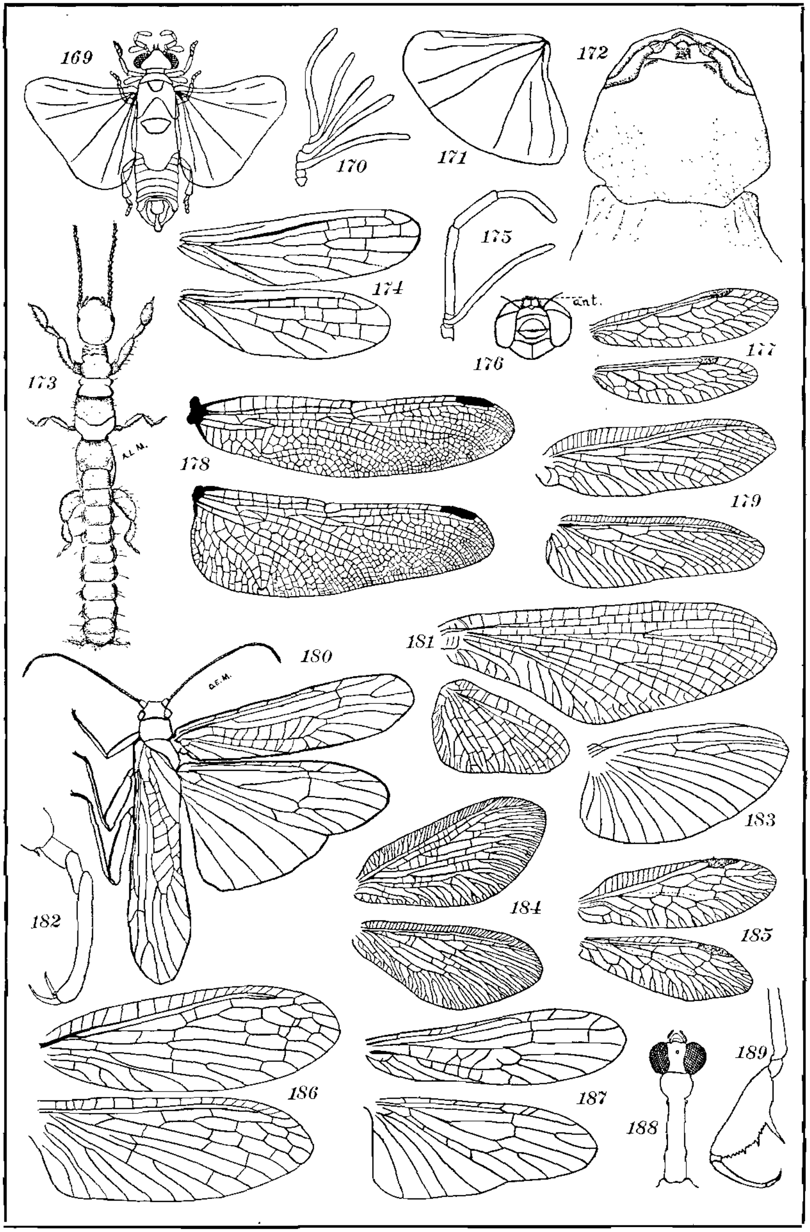
COLEOPTERA.

PLATE 8.

Strepsiptera, Embiidaria, Odonata, Megaloptera, Plectoptera, Plecoptera, Neuroptera, Raphidoidea.

169. **Stylops.** (Pierce) [Xenidæ]
170. **Anthericomma,** antenna of male. (Pierce) [Halictophagidæ]
171. **Xenos,** wing of male. (Kirby) [Xenidæ]
172. **Xenos,** head of female. (Brues) [Xenidæ]
173. **Anisembia.** (Melander) [Embiidæ]
174. **Donaconethis,** wings. (Enderlein) [Olynthidæ]
175. **Cænocholax,** antenna of male. (Pierce) [Xenidæ]
176. **Libellula,** head. (Hyatt & Arms) [Libellulidæ]
177. **Mantispa,** wings. (Handlirsch) [Mantispidæ]
178. **Libellula,** wings. [Libellulidæ]
179. **Corydalis,** wings. (Handlirsch) [Corydalidæ]
180. **Chloroperla.** [Perlidæ]
181. **Chirotenetes,** wings. (Needham) [Ephemeridæ]
182. **Perla,** tarsus. [Perlidæ]
183. **Cænis,** wing. (Needham) [Ephemeridæ]
184. **Dilar,** wings. (Handlirsch)]Dilaridæ]
185. **Raphidia,** wings. (Handlirsch) [Raphidiidæ]
186. **Chauliodes,** wings. [Corydalidæ]
187. **Perla,** wings. [Perlidæ]
188. **Mantispa,** head and prothorax from above. [Mantispidæ]
189. **Mantispa,** raptorial front leg. [Mantispidæ]



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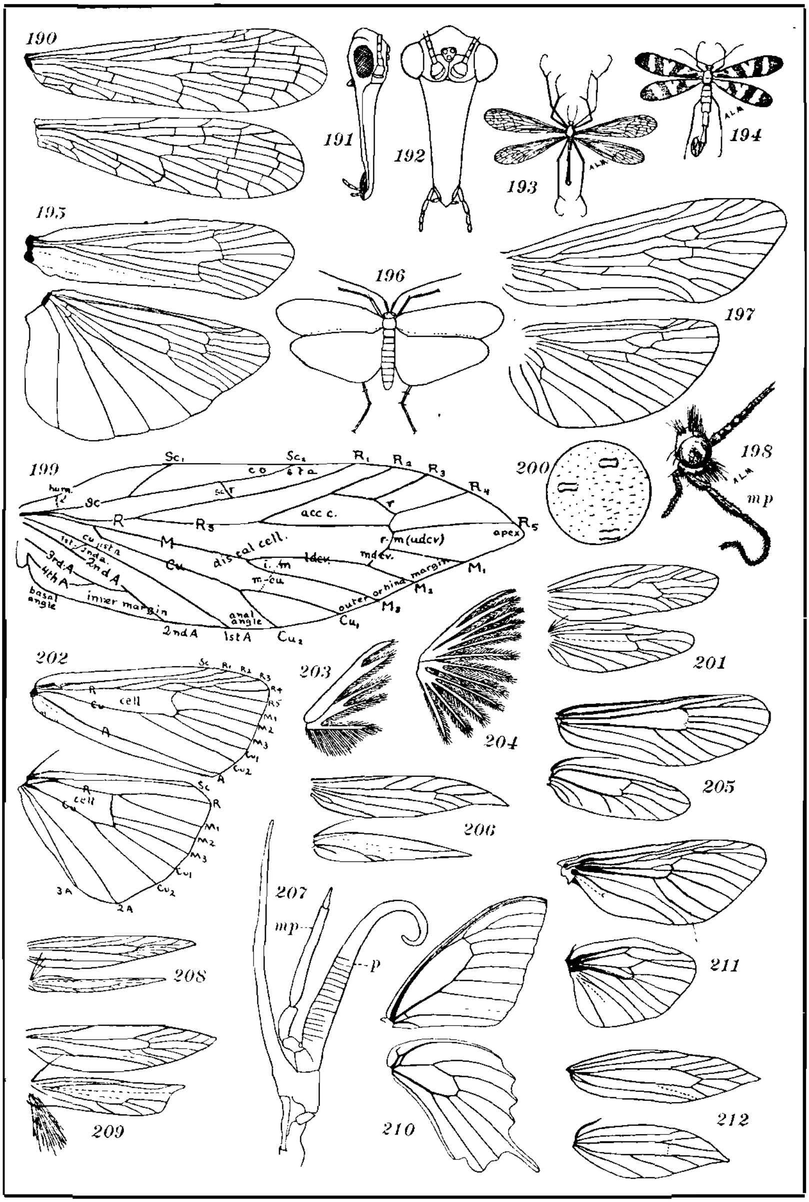
STREPSIPTERA, EMBIDIIARIA, ODONATA, MEGALOPTERA, PLECTOPTERA, PLECOPTERA, NEUROPTERA, RAPHIDIOIDEA.

PLATE 9.

Panorpatæ, Trichoptera, Lepidoptera.

190. **Panorpa,** wings. [Panorpidæ]
191. **Panorpa,** head from side. (Packard) [Panorpidæ]
192. **Panorpa,** head from front. (Packard) [Panorpidæ]
193. **Bittacus.** [Bittacusidæ] ×0.5
194. **Panorpa.** [Panorpidæ] ×0.5
195. **Limnephilus,** wings. [Limnephilidæ]
196. **Limnephilus.** [Limnephilidæ] ×1
197. **Hydropsyche,** wings. (Ulmer) [Hydropsychidæ]
198. **Hydropsyche,** head. [Hydropsychidæ]
199. **Eriocephala,** wing. (Forbes) Sc., subcosta; R., radius; M., media; Cu., cubitus; A., anal (their branches indicated by numbers); hum., humeral crossvein; udcv., upper discocellular vein (radio-medial crossvein); ldcv., lower discocellular vein; i., intercalated cell; ac. c., accessory cell. [Eriocephalidæ]
200. Portion of bleached wing membrane, showing points of attachment of scales and aculeæ (prickles). (Forbes)
201. **Setomorpha,** wings. (Busck) [Tineidæ]
202. **Noctua.** (Forbes) Lettering as in fig. 199. [Noctuidæ]
203. **Pterophorus,** wings. (Berlese) [Pterophoridæ]
204. **Orneodes,** wings. (Berlese) [Orneodidæ]
205. **Harrisina,** wings. (Jones) [Pyromorphidæ]
206. **Coleophora,** wings. [Cosmopterygidæ]
207. **Pronuba,** mouthparts. (Packard) m. p., maxillary palpus; pl., palpifer. [Prodoxidæ]
208. **Mompha,** wings. (Busck) [Cosmopterygidæ]
209. **Agnippe,** wings. (Busck) [Gelechiidæ]
210. **Papilio,** wings. (Comstock) [Papilionidæ]
211. **Prionoxystus,** wings. (Comstock & Needham) [Cossidæ]
212. **Coptotriche,** wings. (Walsingham) [Tischeriidæ]



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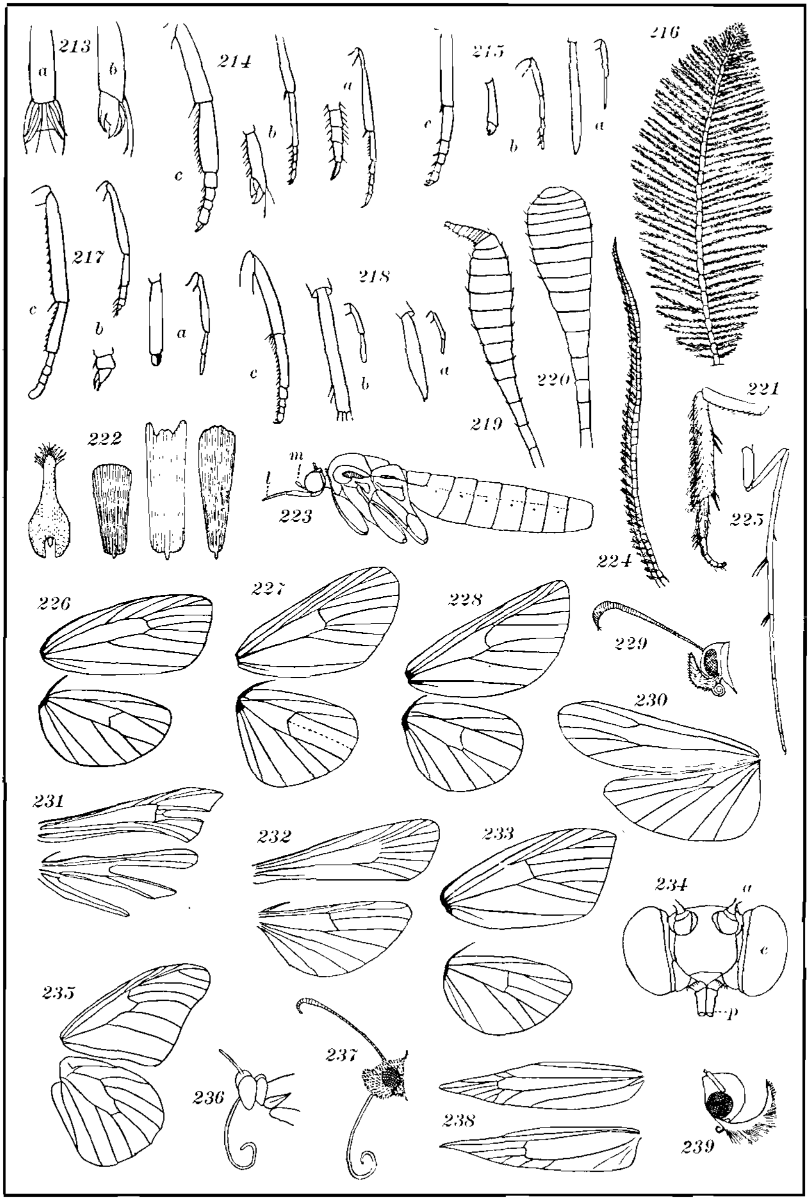
PANORPATÆ, TRICHOPTERA, LEPIDOPTERA.

PLATE 10.

Lepidoptera.

213. **Epargyreus**, last joint of tarsus of male. (Scudder) a, dorsal view; b, latera view. [Hesperiidæ]
214. **Chrysophanus**, details of leg. (Scudder) a, front leg of male with tarsal joints on left more enlarged; b, front leg of female with last tarsal joint on left more enlarged; c, middle leg of male. [Lycænidæ]
215. **Calephelis**, details of legs. (Scudder) a, tibia and tarsus of front leg of male, with tarsus on left more enlarged; b, tibia and tarsus of front leg of female, with last joint on left more enlarged; c, tibia and tarsus of middle leg of male. [Lemoniidæ]
216. Plumose antenna of moth. (Duncan)
217. **Euphydryas**, details of legs. (Scudder) a, tibia and tarsus of front leg of male, with last joints of tarsus on left more enlarged; b, tibia and tarsus of front leg of female with last joints of tarsus below more enlarged; c, tibia and tarsus of middle leg of male. [Nymphalidæ]
218. **Cissia**, details of legs. (Scudder) a, tibia and tarsus of front leg of male, with tarsus on left more enlarged; b. tibia and tarsus of front leg of female, with tarsus on left more enlarged; c, tibia and tarsus of middle leg of male. [Agapetidæ]
219. Antenna of skipper, apical portion. (Duncan) [Hesperiidæ]
220. Antenna of butterfly, apical portion. (Duncan)
221. **Bembecia**, middle leg. (Beutenmüller) [Sesiidæ]
222. Scales from the wings of various Lepidoptera. (Scudder)
223. **Crambus**, lateral outline of body. (Fernald) m., maxillary palpus; l., labial palpus. [Pyralididæ]
224. Antenna of moth. (Duncan)
225. **Pterophorus**, hind leg of male. (Fernald) [Pterophoridæ]
226. **Hypoprepia**, wings. (Hampson) [Lithosiidæ]
227. **Alypiodes**, wings. (Hampson) [Agaristidæ]
228. **Hemiceras**, wings. (Hampson) [Notodontidæ]
229. **Melittia**, head. (Beutenmüller) [Sesiidæ]
230. **Ephestia**, wings. (Chittenden) [Pyralididæ]
231. **Platyptilia**, wings. (Fernald) [Pterophoridæ]
232. **Melittia**, wings. (Beutenmüller) [Sesiidæ]
233. **Nigetia**, wings. (Holland) [Nolidæ]
234. **Anosia**, head from front. (Scudder) a., base of antenna; e., eye; p., base of proboscis. [Lymnadidæ]
235. **Anosia**, wings. (Scudder) [Lymnadidæ]
236. **Euvanessa**, head, prothorax and front of mesothorax. (Scudder) [Nymphalidæ]
237. **Epargyreus**, side view of head. (Scudder) [Hesperiidæ)
238. **Arotura**, wings. (Walsingham) [Cosmopterygidæ]
239. **Gnorimoschema**, head from side. (Busck) [Gelechiidæ]



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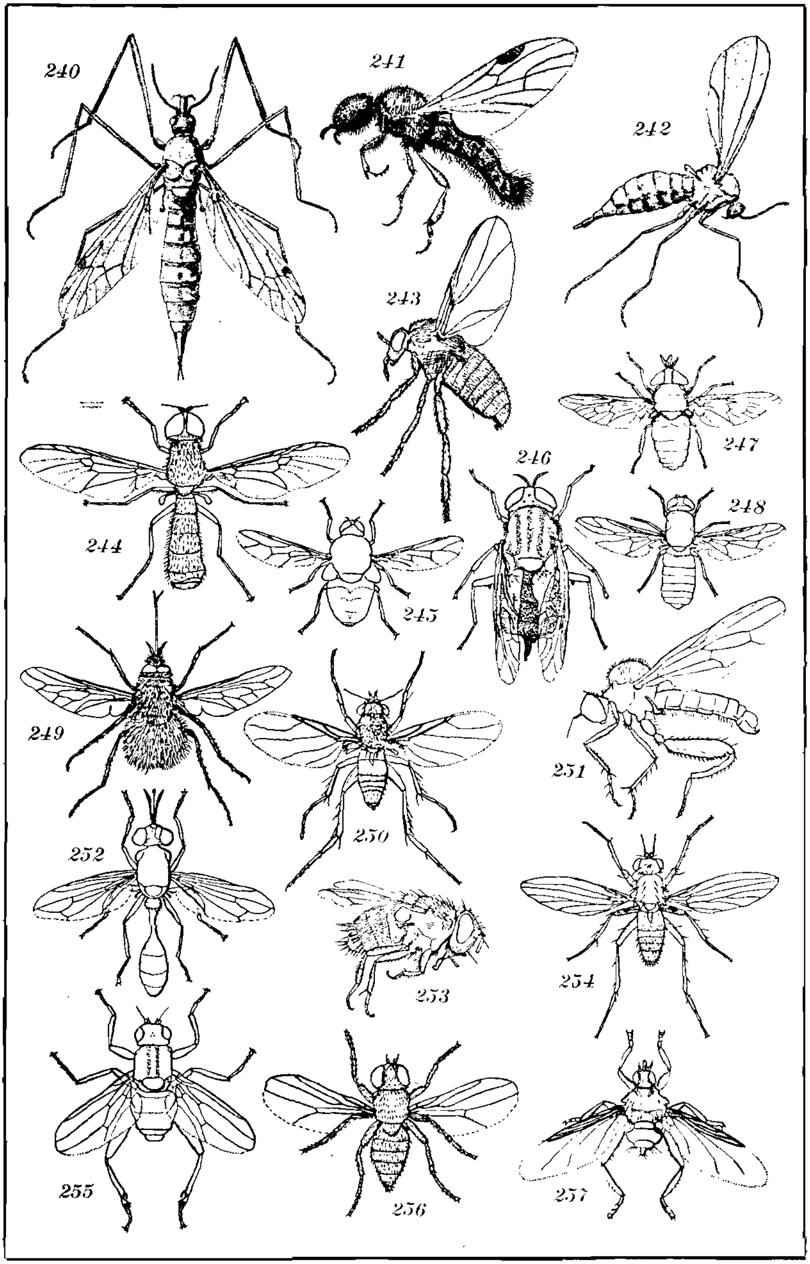
LEPIDOPTERA.

PLATE 11.

Diptera.

240. **Tipula.** [Tipulidæ]
241. **Bibio.** [Bibionidæ]
242. **Mayetiola.** [Cecidomyiidæ]
243. **Simulium.** (Lugger) [Simuliidæ]
244. **Sargus.** (Verrall) [Stratiomyiidæ]
245. **Acrocera.** (Verrall) [Cyrtidæ]
246. **Pantophthalmus.** [Pantophthalmidæ]
247. **Tabanus.** [Tabanidæ]
248. **Scenopinus** (Verrall) [Scenopinidæ]
249. **Bombylius.** (Verrall) [Bombyliidæ]
250. **Paraspiniphora.** (Verrall) [Phoridæ]
251. **Euhybos.** [Empididæ]
252. **Physocephala.** (Lugger) [Conopidæ]
253. **Belvosia.** [Tachinidæ]
254. **Lonchoptera.** (Verrall) [Lonchopteridæ]
255. **Sphærocera.** (Howard) [Borboridæ]
256. **Oscinis.** (Lugger) [Chloropidæ]
257. **Pseudolfersia.** (Lugger) [Hippoboscidæ]



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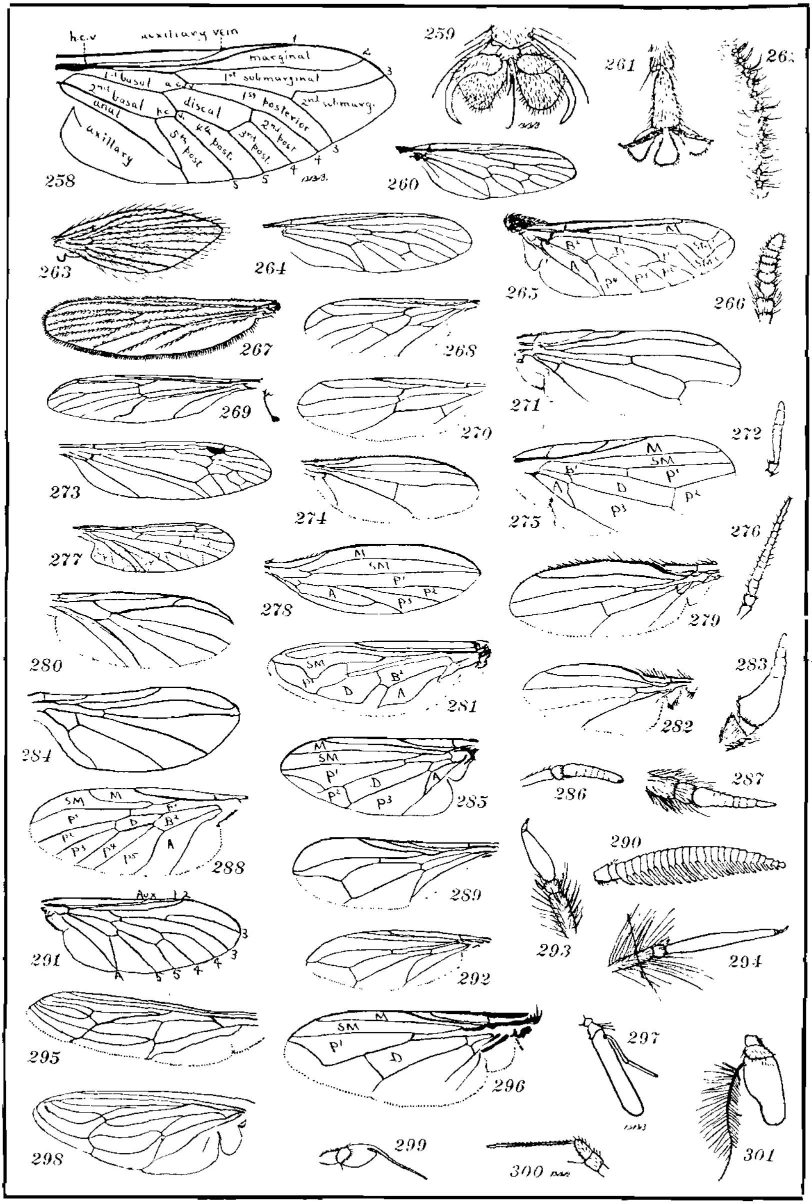
DIPTERA.

PLATE 12.

Diptera.

258. **Tabanus**, wing. (Williston) a. c. v., anterior crossvein; p. c. v., small crossvein [Tabanidæ]
259. **Musca**, apex of tarsus, showing bristle-shaped empodium. (Kellogg) [Muscidæ]
260. **Thereva**, wing. [Therevidæ]
261. **Leptis**, end of tarsus showing empodium. [Rhagionidæ]
262. ***Perrisia***, *antenna of male.* (*Verrall*) [*Cecidomyiidæ*]
263. **Pericoma**, wing. [Psychodidæ]
264. **Stichopogon**, wing. [Asilidæ]
265. **Anthrax**, wing. [Bombyliidæ]
266. **Bibio**, antenna. (Verrall) [Bibionidæ]
267. **Culex**, wing. [Culicidæ]
268. **Empis**, wing. [Empididæ]
269. **Bittacomorpha**, wing. [Ptychopteridæ]
270. **Platypalpus**, wing. [Empididæ]
271. **Scatophaga**, wing. [Scatophagidæ]
272. **Simulium**, antenna. (Verrall) [Simuliidæ]
273. **Tipula**, wing. [Tipulidæ]
274. **Dolichopus**, wing. [Dolichopodidæ]
275. **Euxesta**, wing. [Ortalididæ]
276. **Rhypus**, antenna. (Verrall) [Rhyphidæ]
277. **Blepharocera**, wing. (Comstock) [Blepharoceridæ]
278. **Lonchoptera**, wing. [Lonchopteridæ]
279. **Trixoscelis**, wing. [Geomyzidæ]
280. **Ceroplatus**, wing. [Mycetophilidæ]
281. **Eristalis**, wing. [Syrphidæ]
282. **Meoneura**, wing. [Milichiidæ]
283. **Tabanus**, antenna. (Verrall) [Tabanidæ]
284. **Orphnephila**, wing. (Williston) [Orphnephilidæ]
285. **Platypeza**, wing. [Platypezidæ]
286. **Xylophagus**, antenna. (Verrall) [Xylophagidæ]
287. **Cœnomyia**, antenna. (Verrall) [Cœnomyiidæ]
288. **Rhyphus**, wing. [Rhyphidæ]
289. **Pipunculus**, wing. [Pipunculidæ]
290. **Rhachicerus**, antenna of female. (Vollenhoven) [Xylophagidæ]
291. **Chrysopila**, wing. [Rhagionidæ]
292. **Conops**, wing. [Conopidæ]
293. **Thereva**, antenna. (Verrall) [Therevidæ]
294. **Bombylius**, antenna. (Verrall) [Bombyliidæ]
295. **Rhynchocephalus**, wing. (Williston) [Nemestrinidæ]
296. **Musca**, wing. [Muscidæ]
297. **Gonia**, antenna. (Williston) [Tachinidæ]
298. **Mydas**, wing. (Mydaidæ]
299. **Dolichopus**, antenna. [Dolichopodidæ]
300. **Drapetis**, antenna. (Williston) [Empididæ]
301. **Volucella**, antenna. (Williston) [Syrphidæ]



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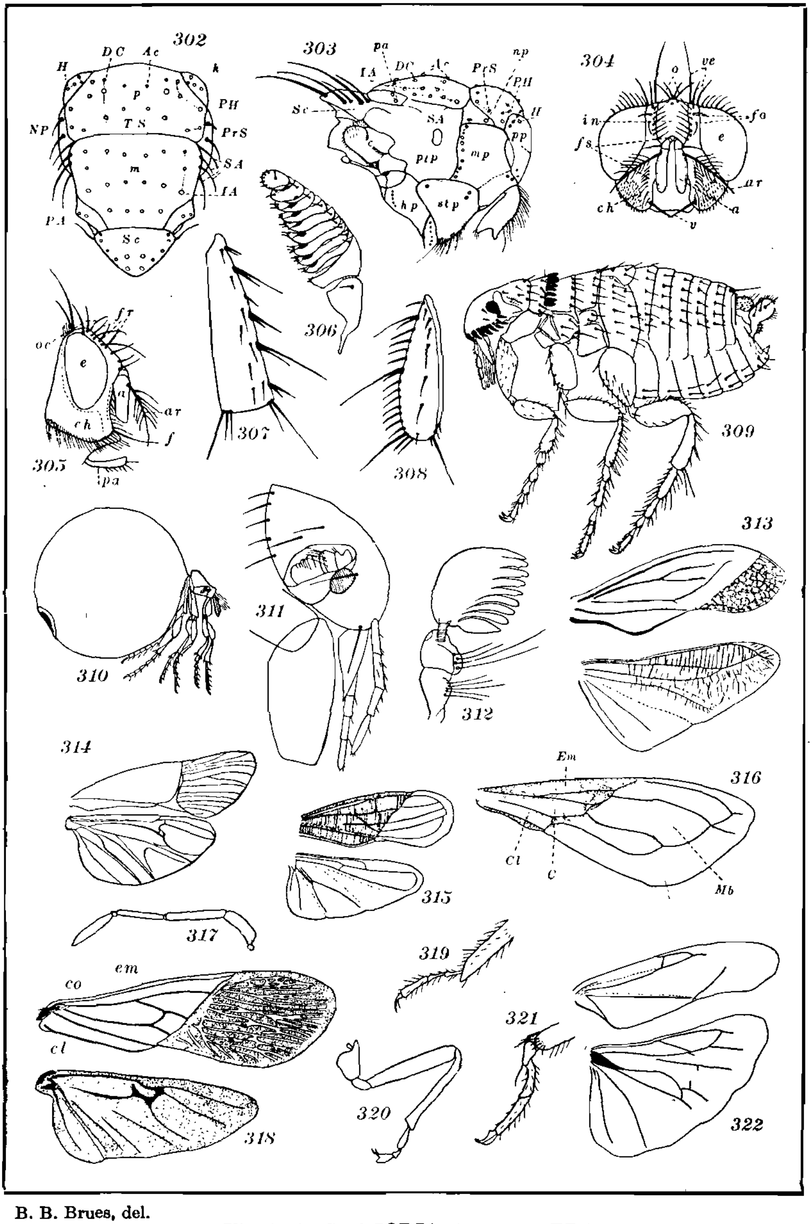
DIPTERA.

PLATE 13.

Diptera, Suctoria, Hemiptera.

302. **Calliphora,** thorax from above. (Walton) Ac., achrostichal bristles; DC., dorsocentral bristles; H., humeral bristles; IA., intra-alar bristles; NP., notopleural bristles; PH., posthumeral bristles; PrS., presutural bristles; SA., supraälar bristles; PA., postalar bristles; Sc., scutellum; c., calypteres; hp., hypopleura; mp., meso- pleura; pa., postalar callosity; pp., propleura; ptp., pteropleura; stp., sternopleura; h., humerus; p., anterior portion of mesothorax (prozona); m., posterior portion of mesothorax (metazona) [Calliphoridæ]
303. **Calliphora,** thorax from side. (Walton) Lettering as in fig. 302. [Calliphoridæ]
304. **Calliphora,** head from front. (Walton) a., antenna; ar., arista; ch., cheek; e., eye; fo., fronto-orbital bristles; fs., frontal suture; in., interfrontalia; o., ocellar bristles; ve., vertical bristles. [Calliphoridæ]
305. **Calliphora,** head from side. (Walton) Lettering as in fig. 304. [Calliphoridæ]
306. **Ceratophyllus,** antenna. (Fox) [Pulicidæ]
307. **Ceratophyllus,** hind tibia. (Fox) [Pulicidæ]
308. **Ctenocephalus,** hind tibia. (Fox) [Pulicidæ]
309. **Ceratophyllus.** (Patton & Cragg) [Pulicidæ]
310. **Dermatophilus.** (Butler) [Dermatophilidæ]
311. **Xenopsylla,** head from side. (Fox) [Pulicidæ]
312. **Ctenocephalus,** antenna. (Patton & Cragg) [Pulicidæ]
313. **Nepa,** wings. (Handlirsch) [Nepidæ]
314. **Catacantha,** wings. (Kirkaldy) [Pentatomidæ]
315. **Acanthia,** wings. (Handlirsch) Acanthiidæ]
316. **Conorhinus,** wings. (Patton & Cragg) Em., embolium; **Cl., clavus;** (corium; Mb, membranaceous area. [Reduviidæ]
317. **Anasa,** antenna. (Tower) [Coreidæ]
318. **Anasa,** wings. (Tower) [Coreidæ]
319. **Reduvius,** tip of tibia and tarsus. (Eysell) [Reduviidæ]
320. **Anasa,** leg. (Tower) [Coreidæ]
321. **Cimex,** tip of tibia and tarsus. (Eysell) [Cimicidæ]
322. **Corixa.** (Handlirsch) [Corixidæ.]



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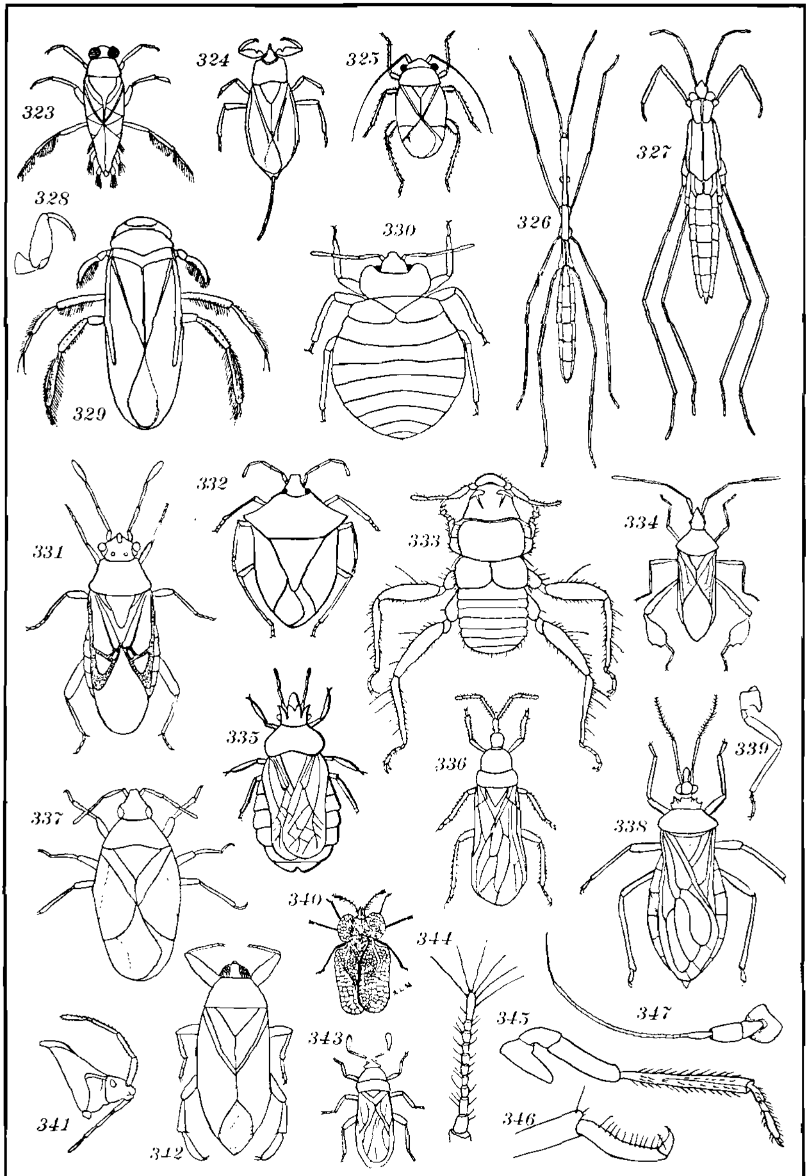
DIPTERA, SUCTORIA, HEMIPTERA.

PLATE 14.

Hemiptera, Homoptera.

323. **Notonecta.** (Miall) [Notonectidæ]
324. **Nepa.** (Miall) [Nepidæ]
325. **Halticus.** (Distant) [Miridæ]
326. **Hydrometra.** (Miall) [Hydrometridæ]
327. **Gerris.** (Miall) [Gerridæ]
328. **Corixa,** front leg. (Kolbe) [Corixidæ]
329. **Corixa.** (Miall) [Corixidæ]
330. **Cimex.** (Patton & Cragg) [Cimicidæ]
331. **Corizus.** (Hambleton) [Corizidæ]
332. **Euschistus.** [Pentatomidæ]
333. **Polyctenes.** (Westwood) [Polyctenidæ]
334. **Leptoglossus.** (Chittenden) [Coreidæ]
335. **Aradus.** (Howard) [Aradidæ]
336. **Henicocephalus.** (Maxwell-Lefroy) [Henicocephalidæ]
337. **Triphleps.** (McGregor) [Anthocoridæ]
338. **Conorhinus.** (Chagas) [Reduviidæ]
339. **Cicada,** hind leg. (Kolbe) [Cicadidæ]
340. **Corythuca.** [Tingitidæ]
341. **Anasa,** prothorax and head. (Hyatt & Arms) [Coreidæ]
342. **Lethocerus.** (Smith) [Belostomatidæ]
343. **Blissus.** (Webster) [Myodochidæ]
344. **Icerya,** antenna of female. (Riley) [Coccidæ]
345. **Entylia,** hind leg. (Branch) [Membracidæ]
346. **Icerya,** tarsus of female. (Riley) [Coccidæ]
347. **Entylia,** antenna. (Branch) [Membracidæ]



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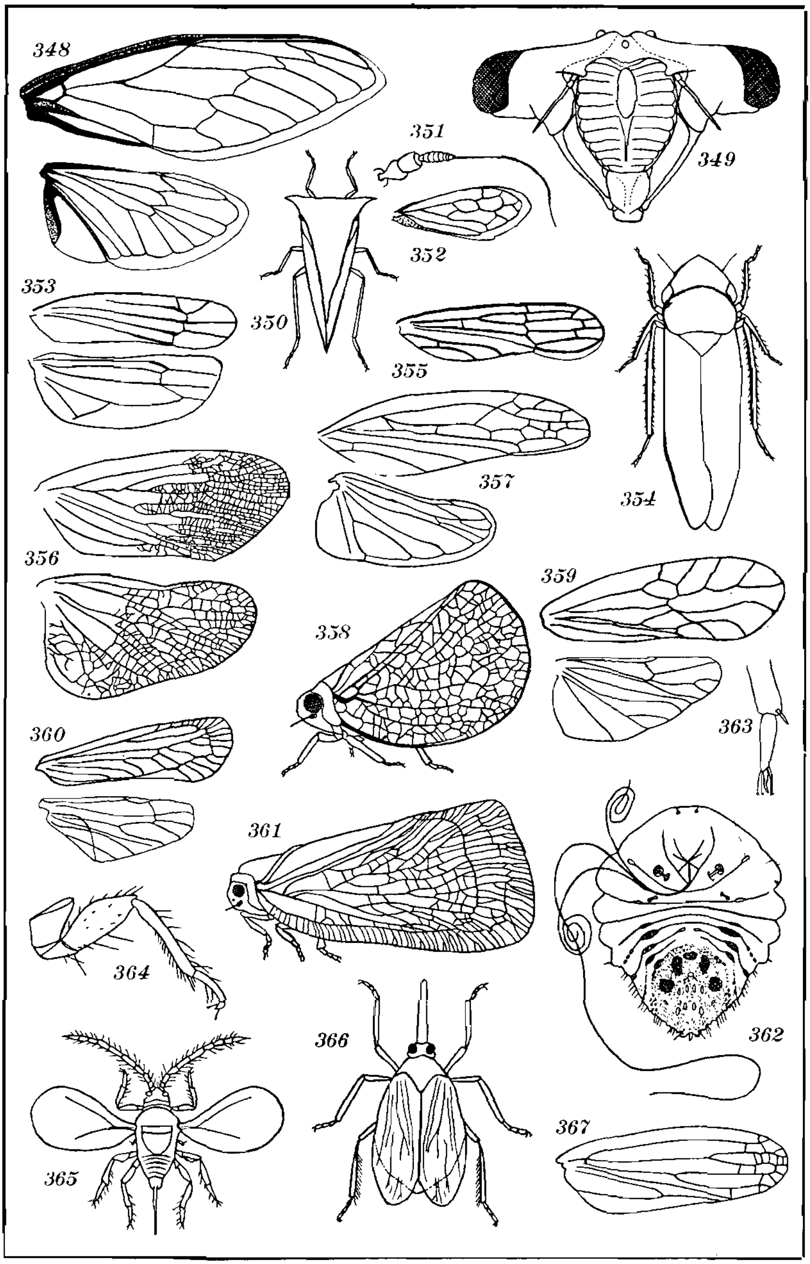
HEMIPTERA, HOMOPTERA.

PLATE 15.

Homoptera.

348. **Cicada,** wings. [Cicadidæ]
349. **Cicada,** head from front. (Berlese) [Cicadidæ]
350. **Ceresa.** (Marlatt) [Membracidæ]
351. **Ceresa,** antenna. (Marlatt) [Membracidæ]
352. **Ceresa,** fore wing. (Marlatt) [Membracidæ]
353. **Typhlocyba,** wings. [Typhlocybidæ]
354. **Tettigoniella.** (Ball) [Proconiidæ]
355. **Oncometopia,** fore wing. (Ball) [Jassidæ]
356. **Poiocera,** wings. (Metcalf) [Fulgoridæ]
357. **Gypona,** wings. (Metcalf) [Proconiidæ]
358. **Ormenis.** (Swezey) [Flatidæ]
359. **Liburnia,** wings. (Metcalf) [Delphacidæ]
360. **Otiocerus,** wings. (Metcalf) [Derbidæ]
361. **Amphiscepha.** (Swezey) [Flatidæ]
362. **Diaspis,** female. (Howard) [Coccidæ]
363. **Rhizococcus,** female, tip of tibia and tarsus. (Packard) [Coccidæ]
364. **Palæococcus,** hind leg. [Coccidæ]
365. **Aspidiotus,** male. (Howard) [Coccidæ]
366. **Scolops.** (Smith) [Cixiidæ]
367. **Scolops,** fore wing. (Metcalf) [Cixiidæ]



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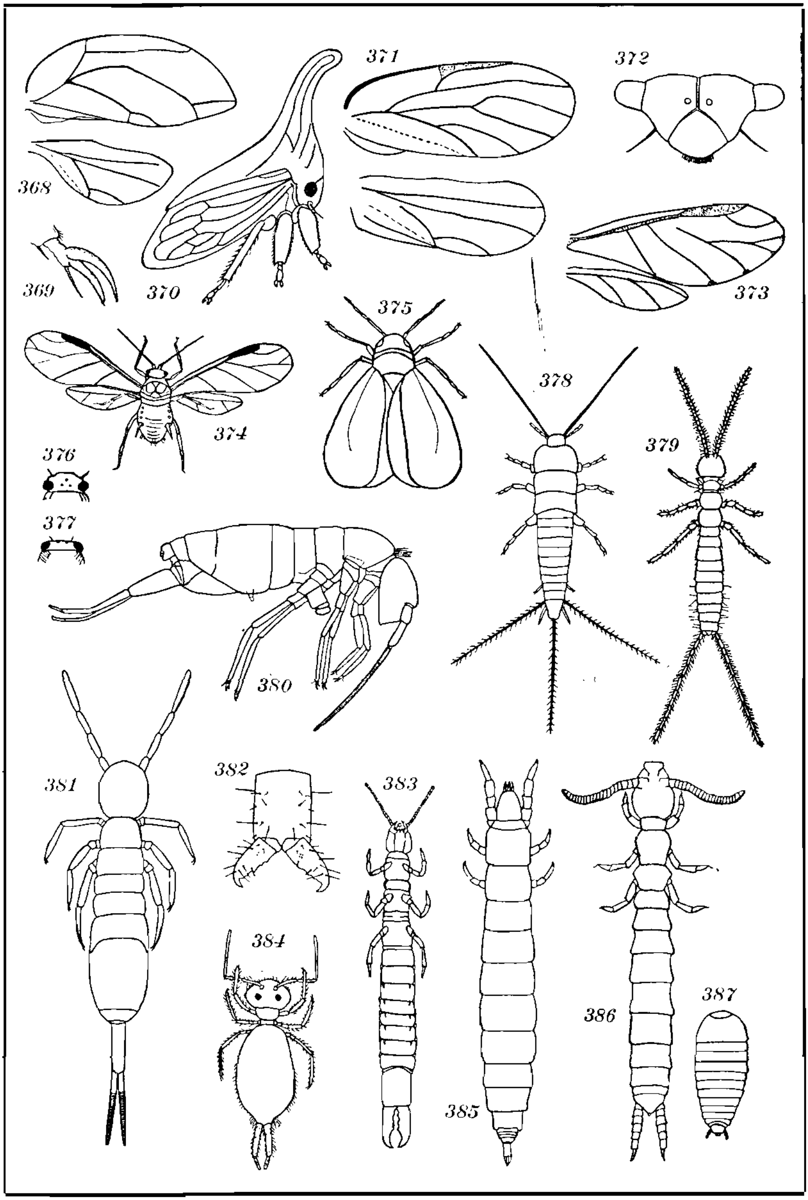
HOMOPTERA.

PLATE 16.

Homoptera, Lepismatoidea, Machiloidea, Rhabdura, Dicellura, Arthropleona, Symphypleona, Protura.

368. **Trioza**, wings. (Patch) [Psyllidæ]
369. **Aleyrodes**, tarsus. (Quaintance) [Aleyrodidæ]
370. **Entylia.** (Branch) [Membracidæ]
371. **Pachypsylla**, wings. (Patch) [Psyllidæ]
372. **Entylia**, head from front. (Branch) [Membracidæ]
373. **Macrosiphum**, wings. (Patch) [Aphididæ]
374. **Aphis.** (Chittenden) [Aphididæ]
375. **Aleyrodes.** (Bemis) [Aleyrodidæ]
376. **Cicada**, head from above. (Maxwell-Lefroy) [Cicadidæ]
377. **Jassid**, head from above. (Maxwell-Lefroy) [Jassidæ]
378. **Lepisma.** (Butler) [Lepismatidæ]
379. **Campodea.** (Maxwell-Lefroy) [Campodeidæ]
380. **Tomocerus.** (Folsom) [Entomobryidæ]
381. **Isotoma.** (Imms) [Entomobryidæ]
382. **Parajapyx**, apex of abdomen. (Silvestri) [Japygidæ]
383. **Japyx**, from below. (Berlese) [Japygidæ]
384. **Sminthurus.** (Sharp) [Sminthuridæ]
385. **Acerentomon.** (Silvestri) [Eosentomidæ]
386. **Anajapyx.** (Silvestri) [Projapygidæ]
387. **Gastrotheus.** (Silvestri) [Lepismatidæ]



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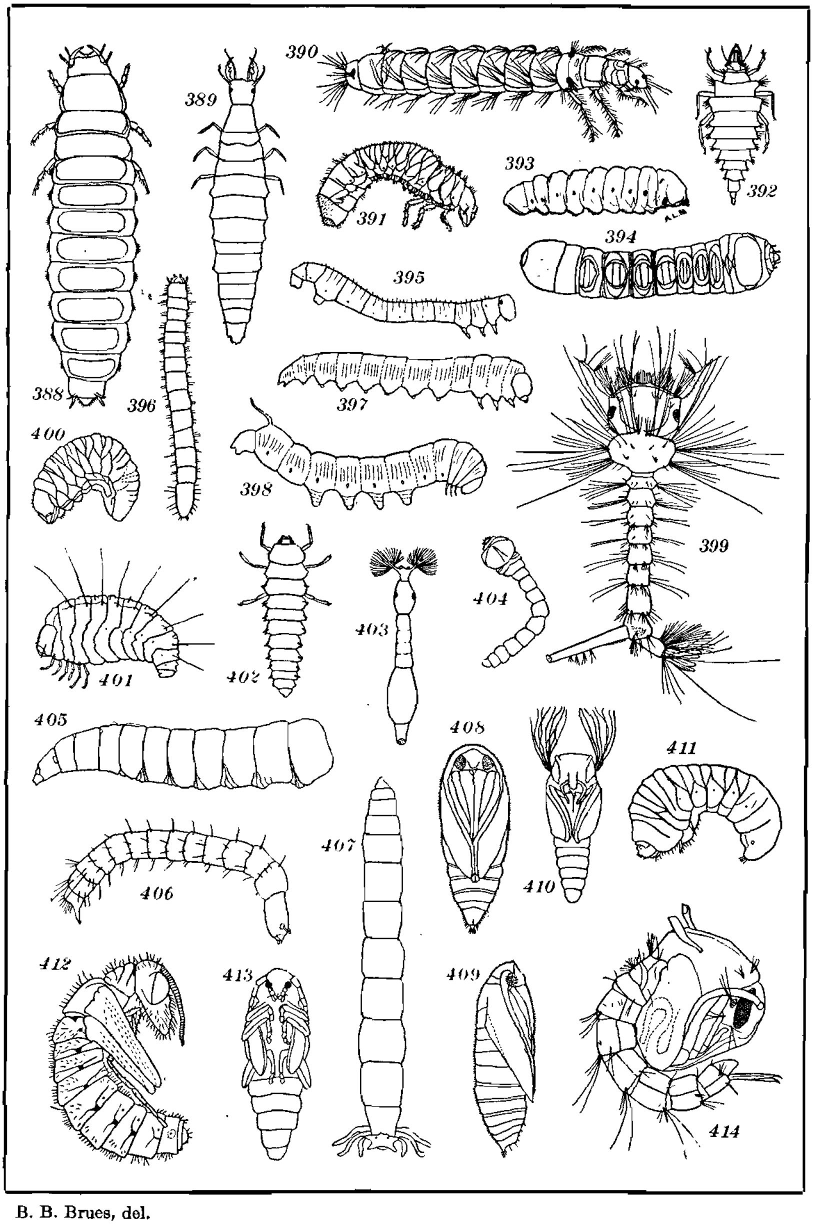
HOMOPTERA, LEPISMATOIDEA, MACHILOIDEA, RHABDURA, DICELLURA, ARTHROPLEONA, SYMPHYPLEONA, PROTURA.

PLATE 17.

Immature Stages of Various Insects.

388. **Calosoma**, larva. (Duncan) [Coleoptera: Carabidæ]
389. **Dytiscus**, larva. (Maxwell-Lefroy) [Coleoptera: Dytiscidæ]
390. Phryganeid larva. (Duncan) [Trichoptera]
391. **Lachnosterna**, larva. (Forbes) [Coleoptera: Scarabæidæ]
392. **Chrysopa**, larva. (Chittenden) [Neuroptera: Chrysopidæ]
393. **Mallodon**, larva, lateral view. [Coleoptera: Cerambycidæ]
394. Same, ventral view. (Packard)
395. Geometrid larva. (Packard) [Lepidoptera: Geometridæ]
396. **Melanotus**, larva. (Forbes) [Coleoptera; Elateridæ]
397. Saw-fly larva. (Maxwell-Lefroy) [Hymenoptera: Tenthredinidæ]
398. **Acherontia**, larva. (Maxwell-Lefroy) [Lepidoptera: Sphingidæ]
399. **Culex**, larva. (Dyar) [Diptera: Culcidæ]
400. **Hylastinus**, larva. (Chittenden) [Coleoptera: Ipidæ]
401. **Bruchus**, larva. (Howard) [Coleoptera: Bruchidæ]
402. **Anatis**, larva. (Britton) [Coleoptera: Chrysomelidæ]
403. **Simulium**, larva. (Osborn) [Diptera: Simulidæ]
404. **Chrysobothris**, larva. (Chittenden) [Coleoptera: Buprestidæ]
405. **Musca**, larva. (Howard) [Diptera: Muscidæ]
406. **Pulex**, larva. (Chittenden) [Suctoria: Pulicidæ]
407. **Tipula**, larva. (Needham) [Diptera: Tipulidæ]
408. **Gelechia**, pupa, under side. (Hunter) [Lepidoptera: Gelechiidæ]
409. Same, side view. (Hunter)
410. **Simulium**, pupa. (Miall) [Diptera: Simuliidæ]
411. **Lyctus**, larva. (Hopkins) [Coleoptera: Lyctidæ]
412. **Sialis**, pupa. (Davis) [Megaloptera: Sialididæ]
413. **Cyllene**, pupa. (Hopkins) [Coleoptera: Cerambycidæ]
414. **Culex**, pupa. (Knab) [Diptera: Culicidæ]



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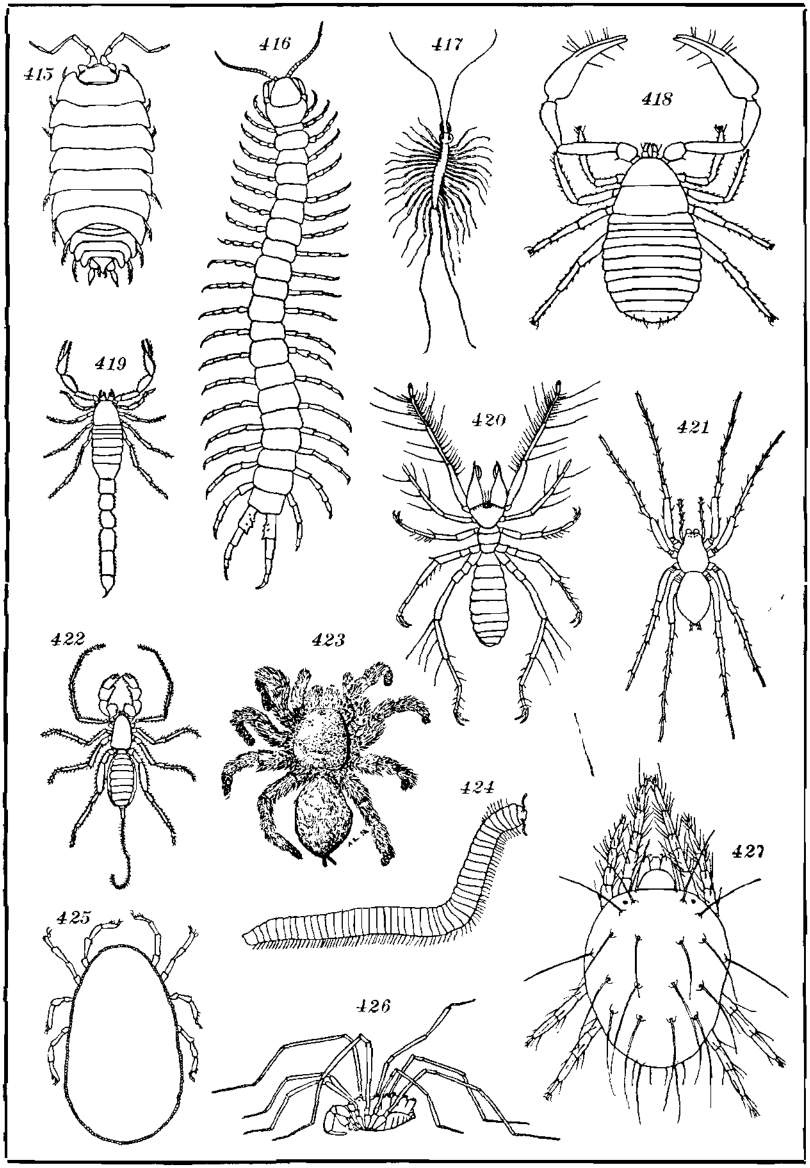
IMMATURE STAGES OF VARIOUS INSECTS.

PLATE 18.

Various Terrestrial Arthropods, not Insects.

415. **Porcellio.** (Richardson) [Crustacea]
416. **Scolopendra.** (Newport) [Chilopoda]
417. **Scutigera.** (Howard) [Chilopoda]
418. **Chelifer.** (Ewing) [Arachnida]
419. **Buthus.** (Kræplin) [Arachnida]
420. **Galeodes.** (Dufour) [Arachnida]
421. **Tegenaria.** (Emerton) [Arachnida]
422. **Thelyphonus.** (Kræpelin) [Arachnida]
423. **Eurypelma.** [Arachnida]
424. **Julus.** (Stebbing) [Diplopoda]
425. **Argas.** (Bishopp) [Arachnida]
426. **Protolophus.** (Banks) [Arachnida]
427. **Tetranychus.** (Woodworth) [Arachnida]



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TERRESTRIAL ARTHROPODS, NOT INSECTS.

GLOSSARY OF SPECIAL TERMS.[1]

This glossary is intended to include only such entomological terms as are not easily understood from the figures referred to in the keys throughout the book, and other words only when their meaning in the keys might not be readily ascertained from an ordinary English dictionary.

Abdòmen, the hindermost of the three main body divisions.

Adventítious, not regular, accidental or additional.

Ànal, pertaining to the last abdominal segment or to the hind basal angle of the wing.

Ánnulated, incompletely divided into ring-like joints.

Ánnulus, (-li), a ring or band.

Antecóxal sclerite, a part of the metasternum in front of the hind coxæ (Coleoptera) (Pl. 6, fig. 108).

Antecùbital crossveins, crossveins along the costal border toward the base (Odonata).

Anténna (-næ), a pair of jointed appendages of the head above the mouthparts.

Appendículate cell, a small indistinct cell distal to the marginal cell (Hymenoptera).

Ápterous, wingless.

Árcuate, arched like a bow.

Árculus, a basal crossvein between the radius and cubitus (Odonata).

Arísta, a bristle-like process at or near the end of the antennæ (Diptera).

Aròlium (-ia), a terminal pad of the foot between the claws.

Atténuated, gradually tapering.

Auxíliary vein, the subcostal vein of Diptera, anterior to the first longitudinal vein. (Pl. 12, fig. 258).

Axílla (-lae), a triangular sclerite on each side of the scutellum (Hymenoptera) (Pl. 4, fig. 68, A.)

Bàsal cells, the two cells proximal to the anterior crossvein and the discal cell (Diptera) (Pl. 12, fig. 258).

Bìfid, split into two parts.

Bìlobed, divided into two lobes.

Calýpteres, small membranous disks under the base of the wings (Diptera) (Pl. 13, fig. 303, c.).

Cápitate, with a distinct knob at the tip.

Cárinate, ridged, or furnished with a raised line or keel.

Caudal fílaments or setæ, thread-like processes terminating the abdomen.

Cell, a space in the wing bounded by veins.

Cércus (-ci), a pair of short appendages at the end of the abdomen.

Cheêk, the lateral part of the head between the eyes and the mouth.

Chìtin, the horn-like material forming the hard parts of the body wall.

Clàvate, clubbed or enlarged at the tip.

Clàvus, an oblong basal part along the inner edge of the fore wings (Heteroptera, Homoptera) (Pl. 13, fig. 316).

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[1] Where the plural form is unusual the differing termination is given in parentheses added to the last common letter of the root.

Clýpeus, the sclerite bearing the labrum (Hymenoptera); a horseshoe-shaped sclerite under the margin of the mouth (Diptera).
Coărctate, with narrowed base and enlarged tip.
Comprĕssed, flattened from side to side, as distinguished from depressed.
Cŏnnate, immovably united, fused.
Constrícted, narrowed in the middle.
Còrium, an elongate middle part of the fore wing (Hemiptera).
Còrneous, horn-like in texture.
Cósta, the front margin of the wing, considered as the first vein.
Cóstal ărea, the part of the wing immediately behind the front margin.
Cóstal cell, the space of the wing in front of the subcostal vein.
Cóxa (-xæ), the basal joint of the leg, sometimes quite fused with the body.
Ctenídium (-ia), a comb-like row of bristles.
Cŭbitus, the fifth of the main veins of the wing.
Cursòrial, fitted for running.
Declívity, the abruptly bent apex of the elytra (Coleoptera).
Decúmbent, bending downward.
Dentículate, with minute tooth-like projections.
Dichóptic, eyes not touching (Diptera).
Dígitate, with finger-like processes.
Dòrsal, pertaining to the upper surface or back of the body.
Dorsocĕntral bristles, several rows of bristles near the middle of the mesonotum (Diptera) (Pl. 13, fig. 302, DC).
Ectopărasite, a parasite which lives on the exterior of animals.
Élytron (-ra), the horny upper wings, or wing covers, of beetles.
Empòdium (-ia), a single middle pad between the tarsal claws (Diptera).
Epíphysis (-ses), a lappet-like process.
Epipleŭra (-ræ), the infolded edge of the elytra (Coleoptera).
Épistome, the lowest part of the face.
Epizòic, living on the outside of animals.
Eye-cap, a group of modified scales overhanging the eye (Lepidoptera).
Fàcial plate, the central part of the face (Diptera).
Fèmur (-mora), the thigh or third division of the legs.
Fíliform, hair-like, or filamentous, longer than setaceous.
Flabĕllate, with fan-like processes or projections.
Flabĕllum (-la), a leaf-like or fan-like process.
Flagĕllum, the distal part of the antenna when lash-like.
Fontanĕl, a small, depressed, pale spot on the front of the head between the eyes (Isoptera).
Fórcipate, bearing pincers, or pincers-shaped.
Frénulum, a strong spine at the front basal angle of the hind wings (Lepidoptera) (Pl. 10, fig. 226).
Front, the forehead, between the antennæ, eyes and ocelli.
Frontălia, the central strip of the front (Diptera) (Pl. 13, fig. 304).
Fróntal lŭnule, a small crescent-shaped space just above the antennæ (Diptera) (Pl. 13, fig. 304).

Frónto-órbital bristles, several bristles along the front next the eyes (Diptera) (Pl. 13, fig. 304).
Fúrcula, the forked springing appendage below the end of the abdomen. (Collembola).
Gèna (-næ), the cheek.
Genículate, abruptly bent, elbowed.
Genitàlia, the external sexual organs.
Gíbbous, puffed out; hunch-backed.
Glàbrous, bald, smooth, free of hairs.
Gonapóphysis (-ses), the short conical egg-laying processes terminating the abdomen.
Graduated crossveins, an oblique row of crossveins forming steps across the wing (Neuroptera).
Grávid, filled with eggs.
Gùlar sùture, a longitudinal impressed line on each side of the gula or middle piece of the throat.
Hálter, a small knobbed appendage on each side of the thorax replacing the hind wings (Diptera).
Háustellate, mouth formed for sucking, the mandibles not fitted for chewing.
Hemélytron (-ra), the modified fore wings of Hemiptera.
Heterómerous, differing in the number of joints in the tarsi.
Holóptic, eyes of the male meeting above the antennæ (Diptera).
Homónomous, similar in form, function or development.
Hùmeral angle, the inner front corner of the wing.
Hỳaline, more or l ss transparent.
Hypopleùral bristles, a more or less vertical row of bristles above **the hind coxæ** (Diptera).
Hypopýgium, the last ventral plate; or the inflexed genitalia.
Inglùvial, pertaining to the crop.
Interfróntal bristles, minute bristles on the central part of the front (Diptera) (Pl. 13, fig. 304).
Interstítial, occurring between two segments, e. g. the trochanter, linking the coxa and femur.
Íntra-àlar bristles, several bristles above the root of the wing next to the dorsocentrals (Diptera).
Jùgum, a lobe-like process at the base of the fore wings overlapping the hind wings (Lepidoptera).
Labéllum (-la), the expanded sensitive tip of the proboscis (Diptera).
Làbium, the lower lip or second maxillæ.
Làbrum, the upper lip.
Laméllа (-læ), a leaf-like plate.
Láminate, composed of leaf-like plates.
Lánceolate, tapering at each end, spear-shaped.
Lárva (-væ), the earlier stages of an insect's life after hatching from the egg **and** before the pupal period.
Láteral, at or pertaining to the side of the body.
Lígula, the central part of the labium, borne by the mentum (Coleoptera).

Lùnule, a small crescent-shaped piece just above the antennæ (Diptera).
Mandíbulate, with jaws fitted for chewing.
Maxílla (-læ), the second pair of appendages belonging to the mouth, **behind the** mandibles or jaws.
Máxillary pálpus, a finger-like jointed appendage on each maxilla.
Mèdia, the fourth of the principal wing-veins.
Méntum, the part of the labium bearing the movable parts.
Mesepistérnum, (-na), the anterior of the oblique side pieces of the mesothorax.
Mesonòtum, the back or upper side of the mesothorax.
Mesopleùra (-ræ), the space below and in front of the root of the wings (Diptera).
Mesostérnum, the middle part of the underside of the mesothorax.
Mesothòrax, the middle of the thoracic divisions, bearing the second legs and the fore wings.
Metamórphosis (-ses), the series of marked external changes through which an insect passes during its development *e. g.* egg, larva, pupa, adult.
Metastérnum, the middle piece of the under side of the metathorax.
Metatársus (-si), the first joint of the tarsus, next to the tibia.
Metathòrax, the third division of the thorax, bearing the hind legs and the hind wings.
Micrópterous, with small wings.
Moníliform, resembling a string of beads.
Neuràtion, the arrangement of the veins of the wings, the venation.
Nòde, a swelling or knot-like knob.
Nòdus, a stout crossvein at the middle of the costal border of the wing (Odonata).
Nòtum, the dorsal surface of the body, particularly of the thorax.
Nýmph, the larval stage of those insects that have no resting pupal period.
Océllus (-li), the simple eyes, usually three in number, on the upper part **of the** head.
Occiput, the back part of the head.
Onýchium (-ia), a pad between the tarsal claws.
Órbit, the part of the head immediately next the eyes.
Óstioles, the paired lateral openings of the heart.
Ovipósitor, the egg laying apparatus.
Pálpus (-pi), one or two pairs of jointed sensitive, finger-like processes borne by the mouth.
Parápsidal furrow, a lengthwise groove between the median line and each side of the mesonotum (Hymenoptera).
Párasite, an animal that feeds on or in some other animal.
Paronýchium (-ia), a bristle-like appendage of the claws or empodium.
Péctinate, with branches like a comb.
Péndulous, hanging from one end.
Pétiolate, attached by a stalk or stem.
Phytóphagous, feeding on plants.
Plántula (-læ), one of the soles of the feet.
Pleùrite, one of the side pieces of the body.
Plùmose, feathery.

Postèrior callósity, a swelling between the root of the wings and the scutellum (Diptera).
Postèrior cells, a variable number of cells extending to the hind margin of the wings, the first bounded inwardly by the anterior crossvein (Diptera).
Posthùmeral bristle, one or more bristles placed just inside of the shoulder-swelling (Diptera).
Postscutéllum, a small piece of the thorax immediately behind the scutellum.
Postvértical bristles, a pair of minute bristles behind the ocelli (Diptera) (Pl. 13, fig. 504).
Preápical bristle, a bristle on the outside of the tibiæ just before the apex (Diptera).
Prédatory, capturing living prey.
Pygídium, the last dorsal segment.
Prefúrca, the petiole of the second and third veins of Diptera.
Presùtural bristle, one or more bristles on each side of the mesonotum just in front of the transverse suture (Diptera) (Pl. 13, fig. 302).
Probóscis, the extended trunk-like or beak-like mouthparts.
Proëpímeron (-ra), that part at the rear of the side of the prothorax next the coxæ.
Pronòtum, the back or upper side of the prothorax.
Propleùra (-ræ), the side portion of the prothorax.
Prostérnum, the middle of the underside of the prothorax.
Prothorácic bristle, a bristle above the front coxæ (Diptera).
Prothòrax, the first division of the thorax, bearing the front legs.
Prùinose, coated with a hoary dust.
Pteropleùral bristles, bristles located on the sides of the body just beneath the root of the wings (Diptera) (Pl. 13, fig. 303).
Pulvíllus, (-li), a pair of pads beneath the tarsal claws.
Pùpa (-pæ), the resting stage preceding the transformation to adult, sometimes called chrysalis.
Ràdial cell, one or more cells near the anterior margin of the wing (Hymenoptera) (Pl. 3, fig. 36).
Ràdial séctor, the posterior of the two main divisions of the radius.
Ràdius, the third of the principal veins of the wings.
Raptòrial, fitted for grasping prey.
Réclinate, pointing backward.
Recùrrent nervure, one or two transverse veins arising from the lower side of the cubital cells (Hymenoptera) (Pl. 3, fig. 36).
Réniform, kidney-shaped.
Retículate, meshed, like net-work.
Róstrum, a beak or snout.
Scàpe, the basal joint or joints of the antennæ.
Sclèrite, any piece of the body wall bounded by sutures.
Scópa, a brush on the underside of the abdomen, for collecting pollen (Hymenoptera).
Scutéllum, a somewhat triangular or crescentic division at the rear of the mesonotum.
Sérrate, saw-toothed.

Séssile, broadly attached.
Sèta (-tæ), a bristle or filament.
Setàceous, bristle-like, slender.
Sínuous, S-shaped, winding back and forth.
Small-crossvein, a short crossvein extending from the base of the discal cell to the fifth posterior cell (Pl. 12, fig. 258, p. c. v.).
Spâtulate, broad at tip, narrowed at base.
Spínulated, furnished with very small spines.
Spìracles, breathing pores along the sides of the body.
Spúrs, movable spines, usually two, at the end of the tibiæ.
Spùrious vein, an extra vein crossing the anterior crossvein (Diptera) (Pl. 12, fig. 281).
Squamopygídium, a plate formed by the fusion of several apical abdominal segments (Dermaptera).
Stérnite, the ventral piece of each abdominal segment.
Sternopleùral bristles, the bristles on the triangular side piece between the front and middle coxæ (Diptera) (Pl. 13, fig. 303, stp.).
Stígma, a thickening on the costal border of the wings.
Strídulating, making a chirping or creaking noise.
Stȳle, a bristle-like process terminating the antennæ, thicker than the arista (Diptera).
Stȳles, short slender appendages on the underside of the abdomen (Thysanura).
Stȳliform, drawn out as a slender stiff process.
Subanténnal grooves, a groove or grooves in the middle of the face (Diptera).
Subcósta, the second of the principal veins of the wings.
Submèdian cell, a long cell near the base of the wing (Hymenoptera) (Pl. 3, figs. 36, 37, 48, SM.).
Subméntum, the basal part of the mentum.
Súlcate, grooved or furrowed.
Supraànal plate, a dorsal piece terminating the abdomen.
Sûture, the line separating the pieces of the body wall.
Târsus (-si), the foot, the jointed portion of the leg beyond the tibia.
Tégmen (-mina), the toughened upper wings of grasshoppers, etc.
Tégula (-læ), a small convex plate over the root of the fore wings (Hymenoptera) (Pl. 4, figs. 68, 73, T.).
Télson, the last abdominal segment.
Térgite, the dorsal piece of an abdominal segment.
Thôrax, the second of the main divisions of the insect body, between the head and the abdomen, bearing the legs and wings.
Tíbia (-iæ), the shin-joint of the leg, between the femur and the tarsus.
Trìangle, a small triangular cell near the base of the wing (Odonata).
Trochânter, the small joint of the leg between the coxa and the femur.
Trochântin, a small piece on the outer side of the coxa (Coleoptera).
Trúncate, ending squarely, blunt.
Venàtion, the course of the veins or rod-like thickenings of the wings.
Véntral, pertaining to the underside of the body.

Véntral membrane, the skin-like tissue connecting the tergites and the sternites (Diptera).

Véntral segments, the sternites of the abdomen.

Vértex, the crown of the head.

Vertícillate, provided with whorls of fine hairs.

Vestígial, small, degenerate, not functional.

Vibríssa (-sæ), a bristle or bristles on each side of the mouth-opening in front (Diptera) (Pl. 13, fig. 304, v.).

Vivíparous, bringing forth living young, not egg-laying.

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